ruction Methods

October
1932

WINTER CONSTRUCTION—*Yardarm on Hoist Tower Raises Furled Canvas Roof to Next Floor of Building Job*

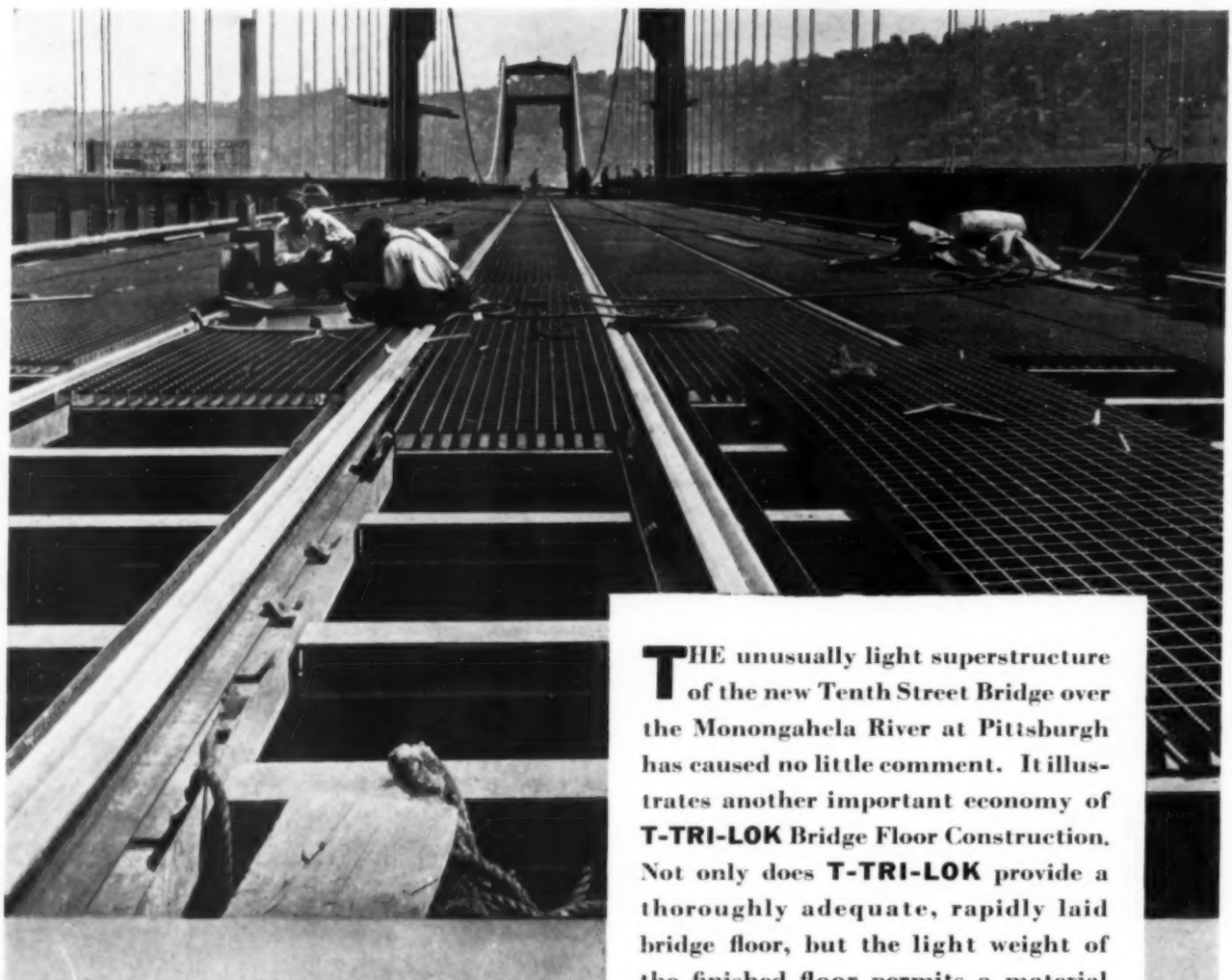
Beginning in This Issue—

"Helps to Successful Contracting"

By Harry O. Locher

Contractor, New York

A series of articles filled with practical suggestions on how to apply business methods to construction, avoid costly mistakes and make the job yield a profit



THE unusually light superstructure of the new Tenth Street Bridge over the Monongahela River at Pittsburgh has caused no little comment. It illustrates another important economy of **T-TRI-LOK** Bridge Floor Construction. Not only does **T-TRI-LOK** provide a thoroughly adequate, rapidly laid bridge floor, but the light weight of the finished floor permits a material reduction in the weight of the superstructure. *Send today for descriptive literature.*

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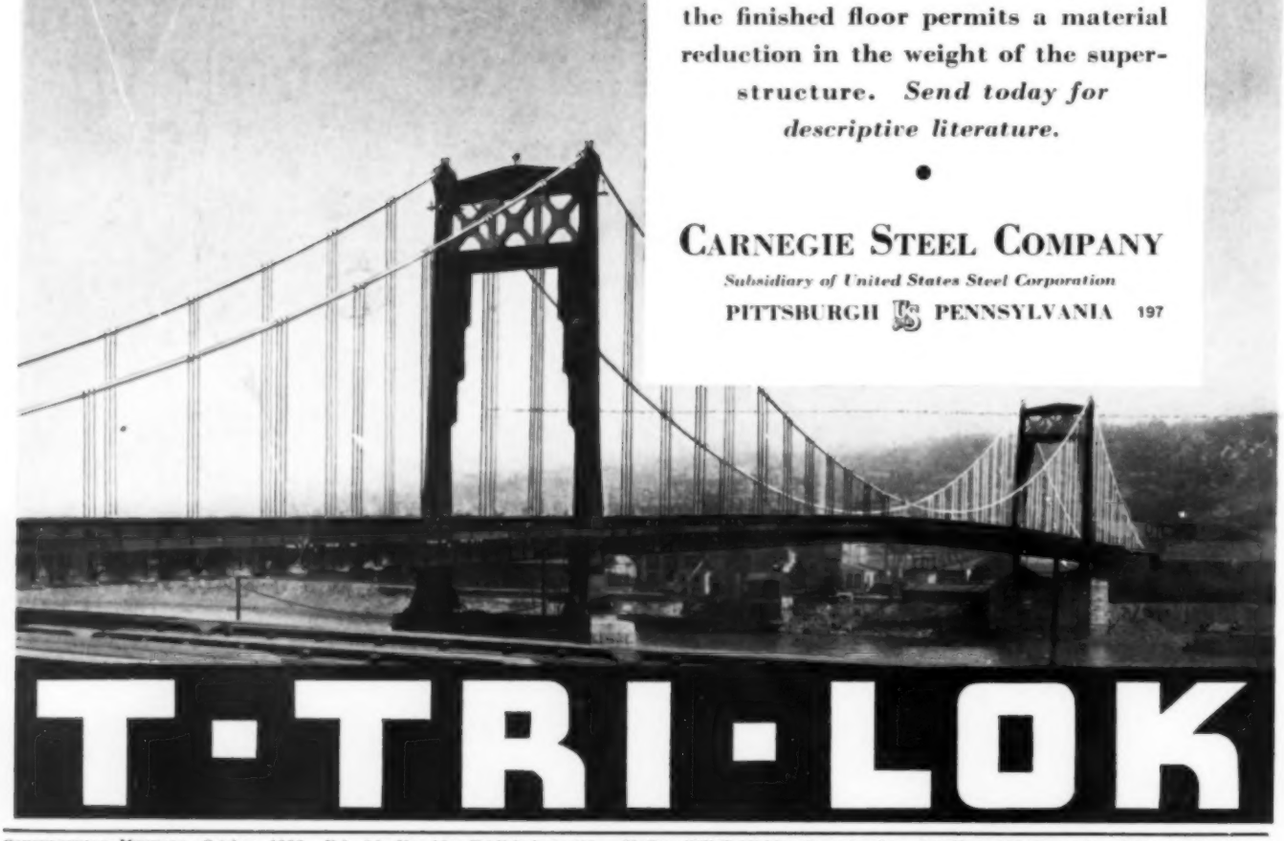
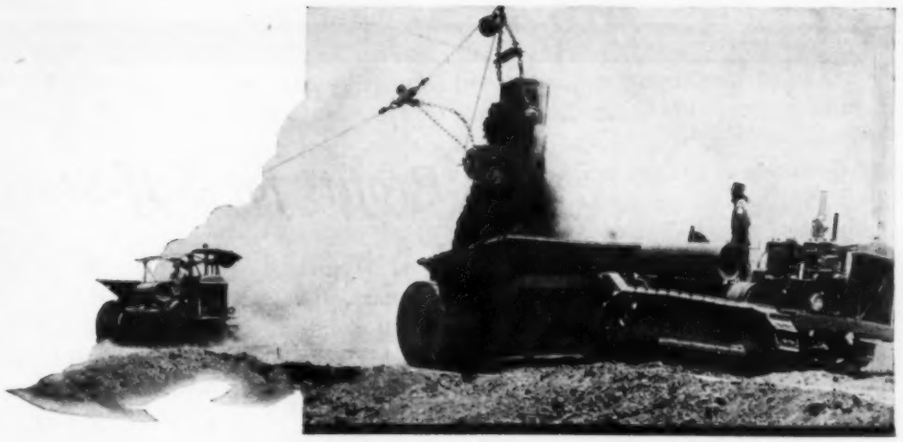


T-TRI-LOK

CONSTRUCTION METHODS, October, 1932. Vol. 14, No. 10. Published monthly. McGraw-Hill Publishing Company, Inc., 330 West 42d Street, New York, N. Y. $1 per year. Central and South American countries and Foreign, $2-U. S. Currency, or 10 Shillings. Canada (including Canadian duty), $1.50. 10 cents per copy. Entered as second-class mater, October, 1926 issue, Vol. 8, No. 19, at the Post Office at New York, N. Y., under the Act of March 3, 1879. Printed in U. S. A.

The Editor Notes—



CONSTRUCTION METHODS

A monthly review of modern construction practice and equipment

ROBERT K. TOMLIN, *Editor*

Editorial Staff

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WILLARD CHEVALIER, *Publishing Director*

McGraw-Hill Publishing Company, Inc.
330 West 42d St., New York, N. Y.

Helps to Successful Contracting

MANY contractors, particularly those in the medium or small-sized groups, go broke, not through inexperience in the technique of construction—for many of them have risen from the ranks of superintendent or foreman — but rather through ignorance of business methods, inability to plan and organize, delay in scrapping and replacing obsolete equipment and eagerness to bid in a job without adequate financial resources.

With construction beginning to pick up and the probability of many new men entering the field, all hungry for work at any price, now, of all times, is there need of sound counsel in making contracting a stable business rather than a gamble. *Construction Methods* will endeavor to supply that need in a series of about a dozen articles, the first of which appears elsewhere in this issue under the head, "Helps to Successful Contracting." The author, Harry O. Locher, is a contractor of long and varied experience, who has served for 30 years in every construction capacity from time clerk to managing partner. Having built levees along the Mississippi, dams for reclamation service in the West, docks on the Pacific Coast, subways in New York, canals, tunnels, pipe lines and railroads, he is well qualified to give exactly the kind of reliable, practical advice that is now so sorely needed.

A reading of the first installment of the series, "Shall I Bid?," will convince you that these articles contain information on contracting practice, from the inside, that neither you nor your superintendents or foremen can afford to miss.

First R.F.C. Loan for Self-Liquidating Project

A start was made last month toward putting to work the $1,500,000,000 fund provided for in the Emergency Relief and Construction Act to help finance the construction of self-liquidating projects. To the Metropolitan Water District of Southern California goes the first loan, amounting to $40,000,000, approved by the Reconstruction Finance Corporation. The money is to be spent on the construction of the 240-mile aqueduct which will convey water from the Colorado River, below the Hoover dam, across California to a group of 12 municipalities in the Los Angeles region. The estimated cost of the entire project, which will require 6 years to complete, is $220,000,000.

To the construction industry the approval of this first loan carries a two-fold significance: It means not only the start of a project that will give employment to thousands of men and will require a big outlay in equipment and materials, but also that the machinery has been set in motion to stimulate, through construction, a nation-wide revival of business activity.

To Consolidate Construction Interests

Members of the American Road Builders' Association who attend that organization's annual convention at Detroit during the week of Jan. 16, will have an opportunity of participating in a new kind of meeting, a Highway and Building Congress embracing, broadly, the entire range of construction interests. With the road builders will convene representatives of a dozen or more national associations, including the Associated General Contractors of America, the Construction League of the United States, and the bodies serving the asphalt, cement, stone, brick, sand, gravel and wire reinforcement interests. While the individual associations will meet separately during the early days of the week, they will later combine into one or more consolidated gatherings which will constitute a gigantic construction congress. Its purpose will be to integrate the many individual construction interests into a huge, cohesive whole and to make construction articulate by providing it with a voice that will command nation-wide attention.

Winter Construction and Its Cost

AN increase of 16½ per cent in cost of winter bridge construction over that of summer construction, as computed by the Ohio department of highways and reported in *Construction Methods* last month, undoubtedly represents a fair margin for work undertaken with the required speed and on the unprecedented scale of Ohio's emergency relief program. In constructing 351 structures scattered over an entire state a great army of contractors of varying experience and capacity necessarily was involved. To the majority of them winter construction was an untried experience. In adapting their organizations to new conditions, allowance had to be made for the cost of acquiring knowledge and skill through the unavoidable process of trial and error.

Thus, although 16½ per cent represents a wholly justifiable increase for last winter's bridge construction program in Ohio, it is reasonable to expect that the same contractors could reduce the increment if they were to undertake similar work this winter. Their experience has given them superior skill and adaptability. In the same way, if they were able to continue winter construction for a number of years, they might be counted upon to lower costs progressively.

1933 Profits for Self-Starters

THE time has come to make a new start. The storm has passed, the gale has died down, the floods have abated, the skies are clearing.

Already those who, from necessity or fear, took to cover during the last year or two are emerging from their shelters to take stock of the damage, to plan a comeback and to get under way with it. Government is doing what it can to help. It has striven to minimize loss and to relieve temporary distress. Now it seeks to restore confidence, to expand the basis of credit, to give a new impetus to actual trade.

Industrialists and financiers have taken up their task of stimulating the flow of credit, of promoting advance buying, of reviving private enterprise and capital investment—all essential to general prosperity. With the incentive of low prices the consumer is beginning to satisfy his long-deferred needs with renewed confidence in the stability of his earnings. A widening resumption of trade will add a host of those now idle to the ranks of the consumers.

All this will take time; not so long, perhaps, as some of our economic ghouls would have us think, but long enough at best. Meanwhile there are risks to be taken, sales to be made, profits to be earned. Who will take them and make them and earn them?

During the coming months we shall distinguish between two types of business men. There will be those who play safe—*very* safe. They will wait. They will let someone else take the risks. They will refrain from trying to sell until it becomes easy to sell. They will sit tight until there is "real business"—until the orders come knocking at their doors. They plan to ride as passengers on the journey to restored prosperity.

But unfortunately for their plans, there will be those with greater faith in themselves and their goods. They are the self-starters; they will *not* wait. They know that the storm has wrought great changes in the business map. They have observed the treacherous shifts in the currents of trade, and have located the newly-worn channels that have left many old ones high and dry. They have kept touch with the new craft that ply these channels and with the new skippers that command the old. They know that during the months just ahead the incoming tide of trade will soonest serve those who go out to meet their markets, who advertise their tested stability, their improved wares, their new services designed to meet the needs of a new day. In other words, they believe that those who *make* what business there is will *get* what business there is.

"Time and chance," we are told, "happeneth to all." There will be cases of success through sheer luck. There always have been. But, on the face of it, which of these types is most likely to reap the rewards of the immediate future?

There can be no doubt that, by and large, *1933 profits will go to the self-starters.*

Willard Chevalier

Publishing Director.

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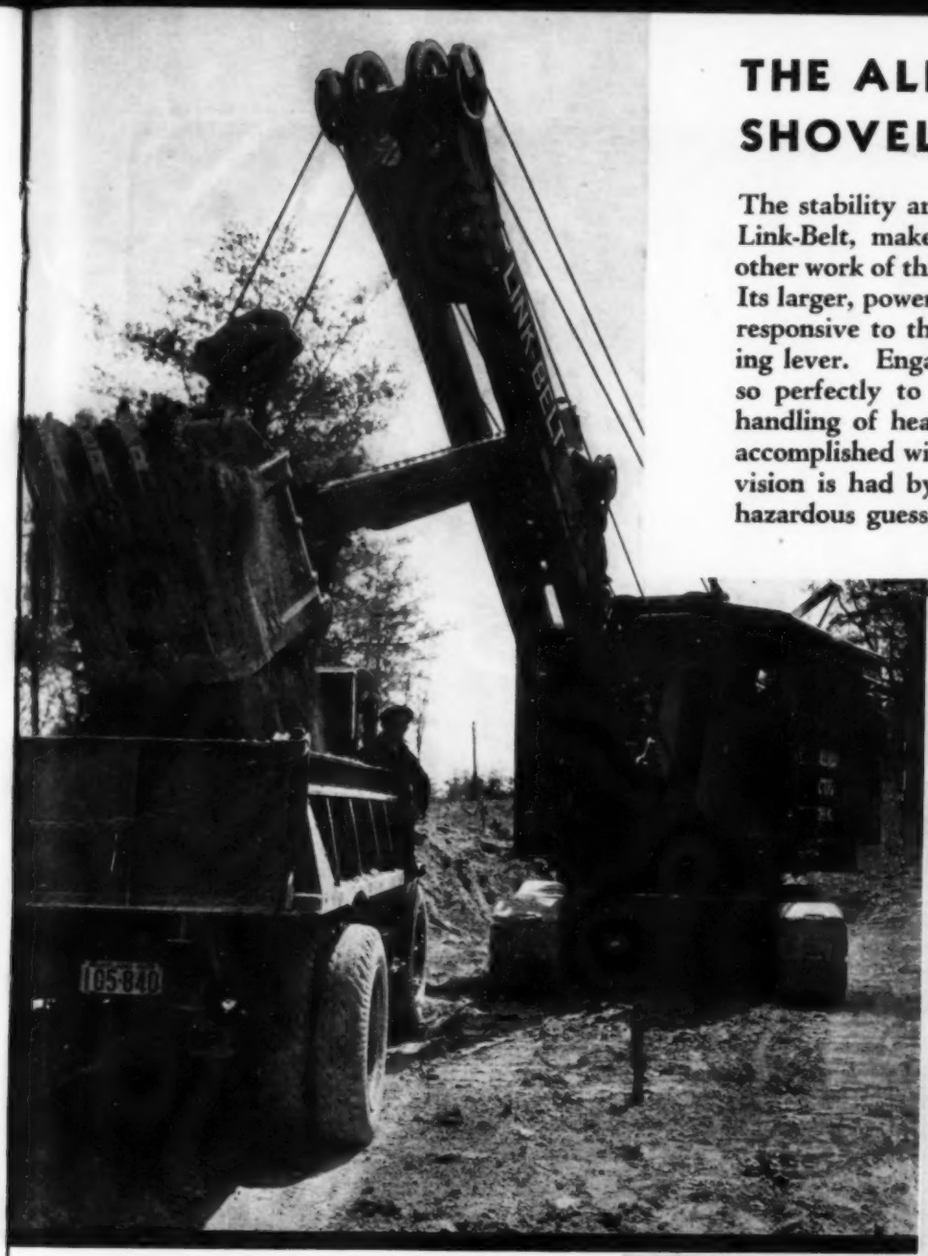
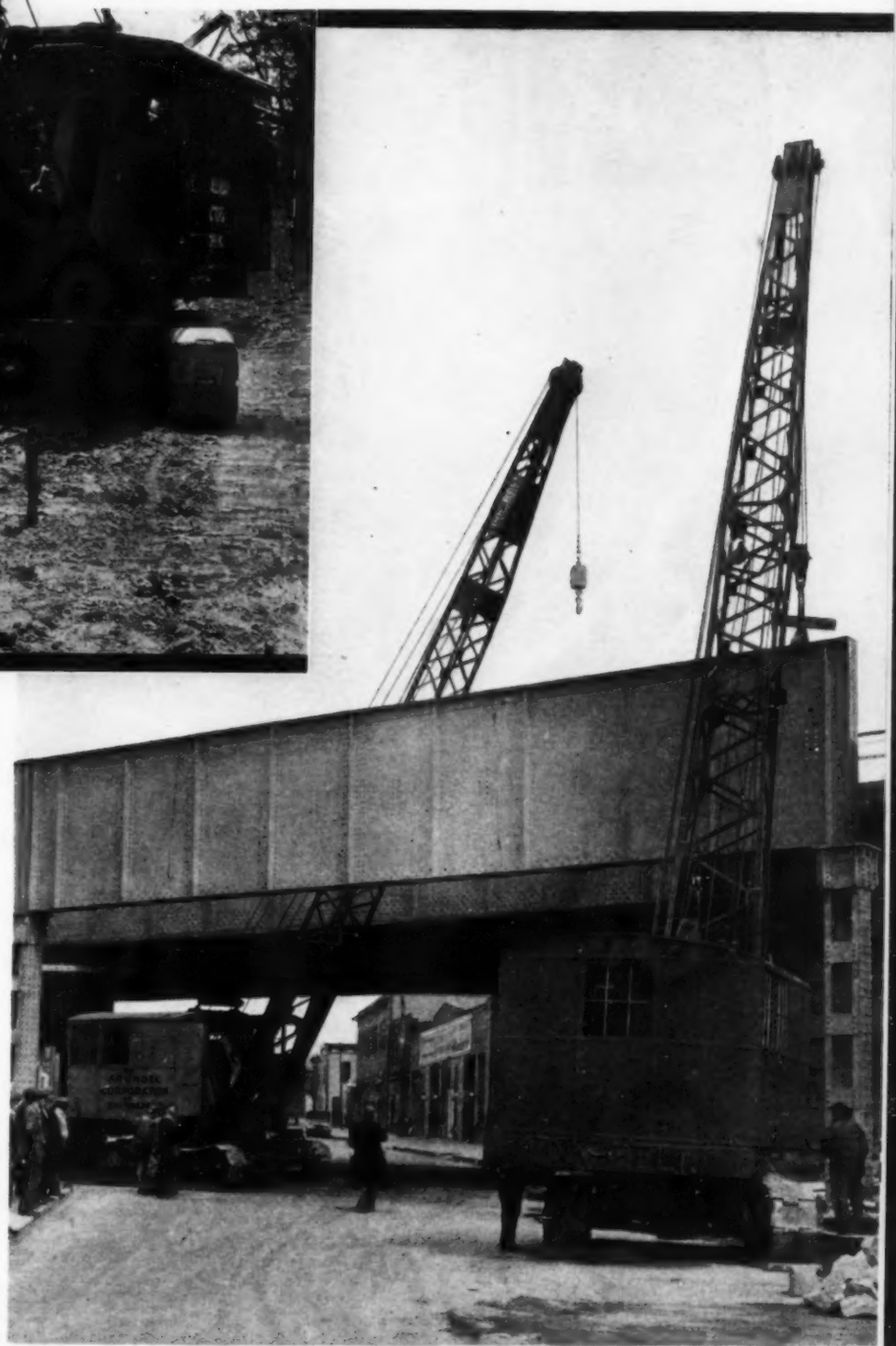


THE ALL PURPOSE SHOVEL—CRANE—DRAGLINE

The stability and perfect mechanical control of the Link-Belt, makes steel erection, stone setting, and other work of this nature, a simple, safe and easy task. Its larger, powerful clutches and brakes are instantly responsive to the slightest movement of the operating lever. Engagement and disengagement respond so perfectly to the lever, that safe, easy and fast handling of heavy loads, even with long booms, is accomplished with smoothness and exactness. Clear vision is had by the operator—no blind spots and hazardous guessing.



Soundness of basic design and the through and through good quality of the Link-Belt shovel-crane-dragline, are responsible for its unusual ability to do a lot of work under severe conditions.

It is "heavy-duty" built to meet all conditions, and not around a few features.

The range of sizes is up to 2½ yds. capacity, gasoline, Diesel or electric operated.

LINK-BELT COMPANY
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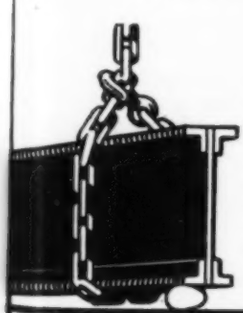
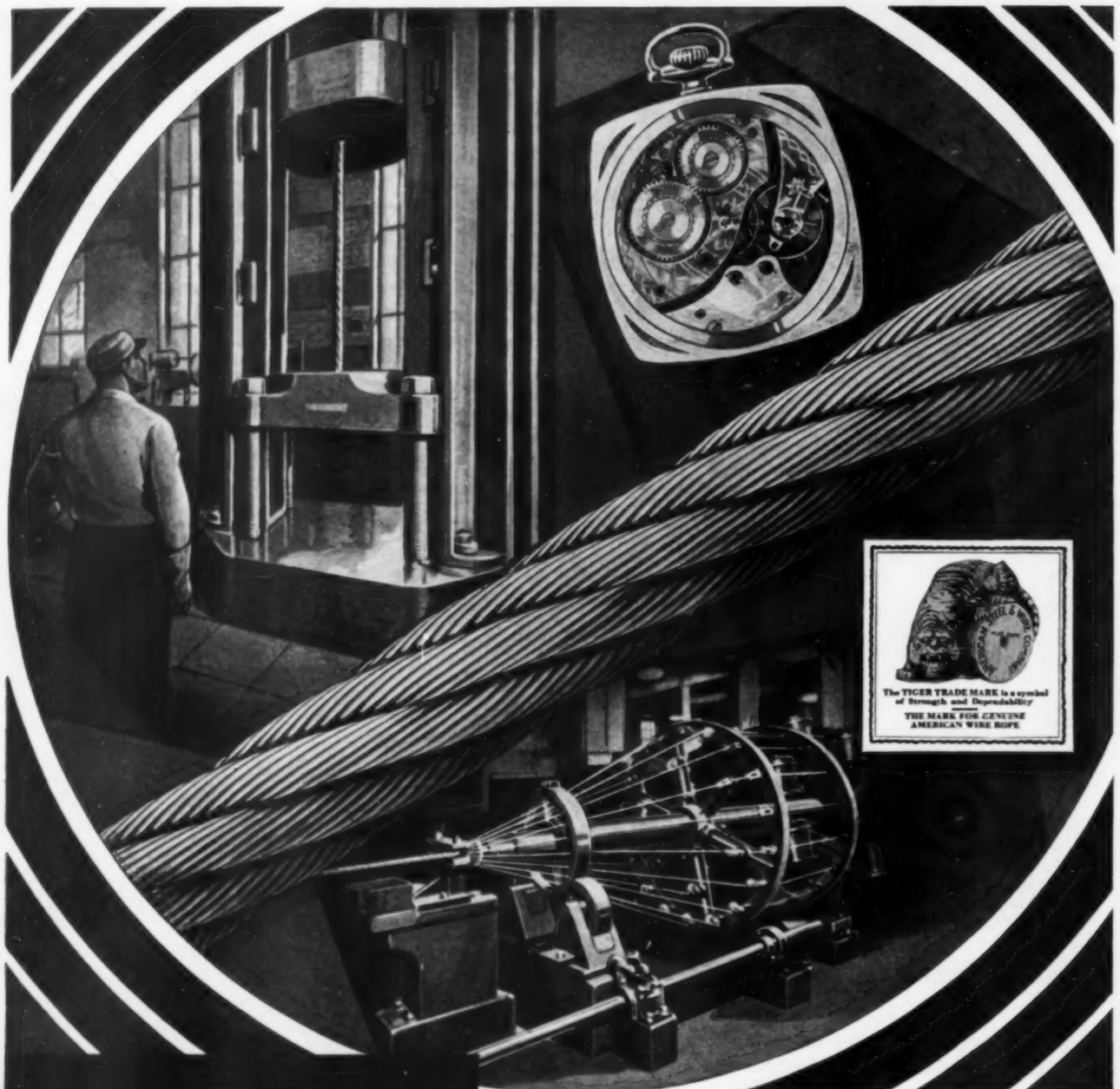


CONTROL

The Link-Belt responds with such smoothness of motion and accuracy of control, that some operators claim they could lower a heavy load accurately enough to come to rest upon an egg without breaking it.

LINK-BELT



AMERICAN
STEEL & WIRE COMPANY
WIRE ROPE

A Watch is Only as Good as its Inner Works

And Wire Rope is only as good as the wires of each strand.

In wire rope manufacture—as in watch making—no end of care must be taken to insure that each part will perform its particular job unfailingly.

Here—then—is a Wire Rope that you may specify for every task that wire rope has to do. Surely—the fact that American Steel & Wire Company Rope outsells all others is proof of performance on the job that saves money and avoids disappointment.

1831 MORE THAN 100 YEARS OF PROGRESS IN WIRE MAKING **1932**

AMERICAN STEEL & WIRE COMPANY

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94 Grove Street, Worcester

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

Empire State Bldg., New York
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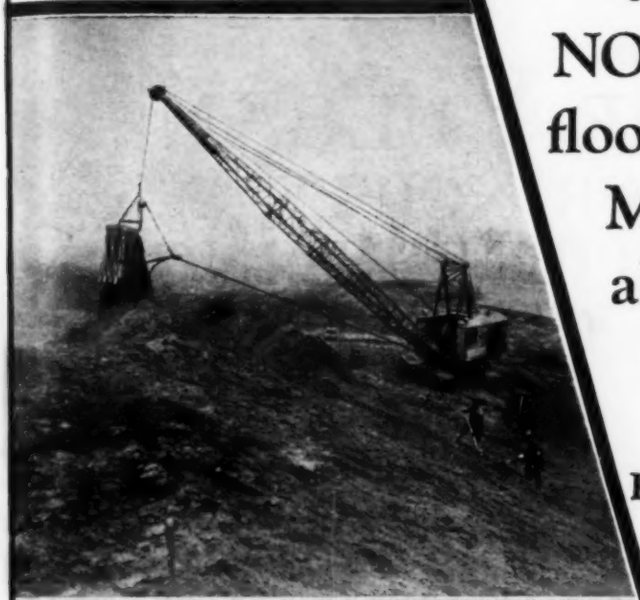
AND ALL PRINCIPAL CITIES

Pacific Coast Distributors: Columbia Steel Company, Russ Building, San Francisco

Export Distributors: United States Steel Products Company, New York

Considering the range of sizes built

there are more NORTHWESTS on flood control on the Mississippi than all other makes combined!



NORTHWEST ENGINEERING CO.
1728 Steger Building
28 East Jackson Boulevard
Chicago, Ill., U. S. A.

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The standard by which draglines are measured

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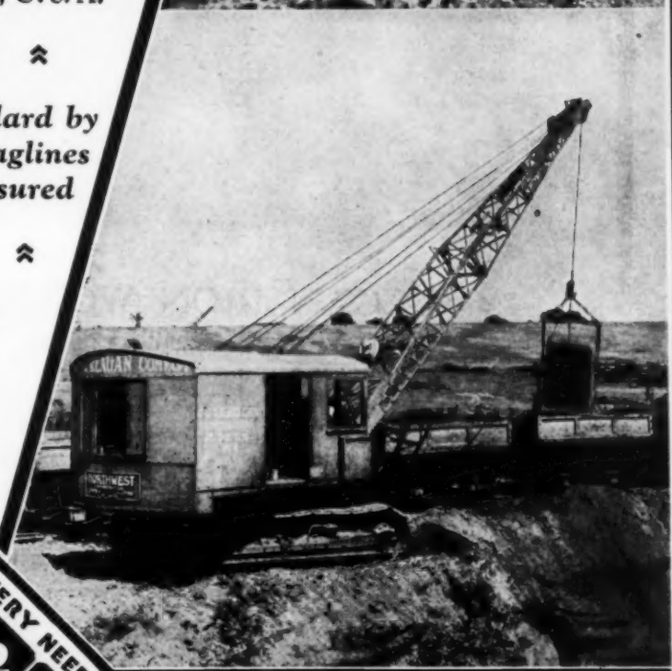
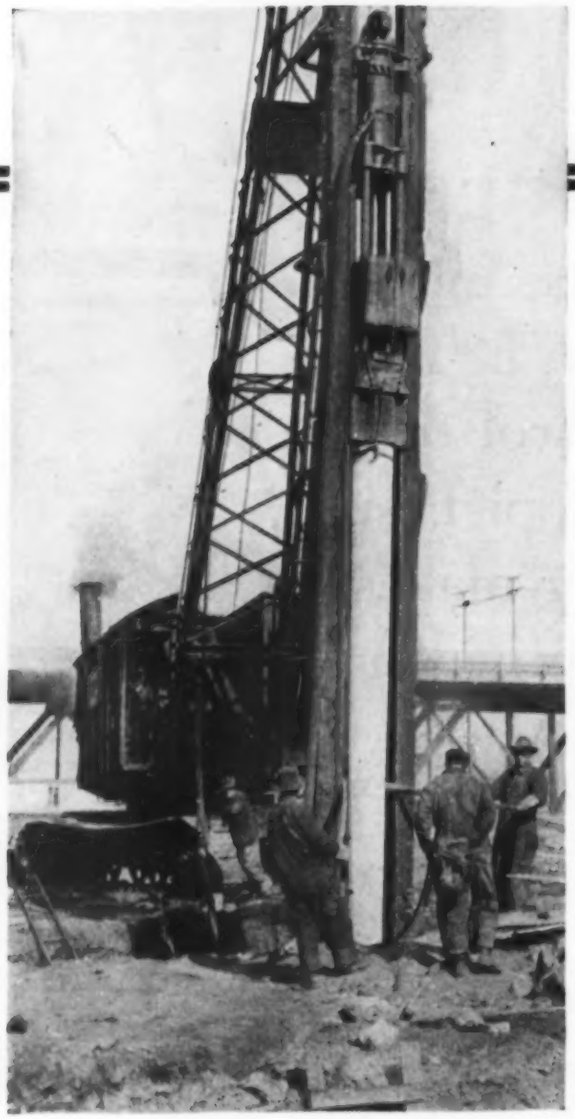


NORTHWEST

SHOVELS » CRANES » DRAGLINES ... PULL-SHOVELS ... SKULLY-TED ...



THE VULCAN PRINCIPLE OF PILE DRIVING GETS RESULTS

When looking for real driving power, with maximum penetration per blow, use a Warrington-Vulcan Pile Hammer. Real punching action can only be obtained with the Vulcan principle of pile hammer design. A heavy ram, falling at low velocity, utilizes a greater percentage of its energy in actually driving the pile, with a minimum damage to the pile head.

Too light and swift a blow will damage the pile and produce little penetration.

It is around this principle of the heavy ram-low velocity blow that Warrington-Vulcan Pile Hammers are built and on which their splendid reputation for economy of time and energy was founded.

VULCAN IRON WORKS
327 North Irving Avenue, Chicago

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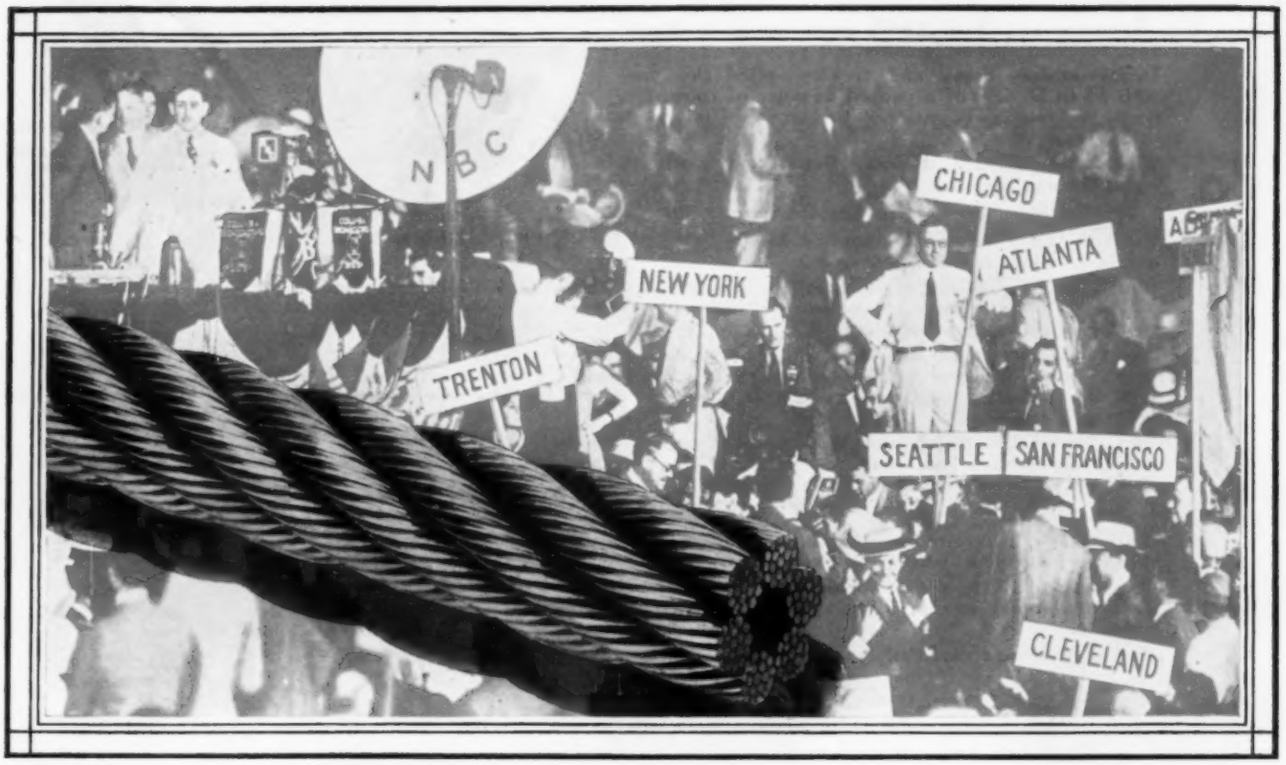
Seattle, Wash.

Warrington-Vulcan PILE DRIVERS



This PLATFORM will appeal to any rope buyer

There are three planks in the Roebling Rope Platform—three simple, clean-cut statements of timely interest to every rope user.

1. Roebling believes that *safety* is the first requirement of practically every rope application. It is, therefore, the definite policy of this company to place safety to the forefront as an essential quality of Roebling Wire Rope and to make this rope unsurpassingly dependable.

2. Roebling advocates the purchase of rope on the basis of "lowest possible operating cost" consistent with this safety. It builds into its ropes the utmost of strength and stamina and confidently asserts that NO wire rope, regardless of make or construction, will show lower general-average operating cost.

3. It is Roebling's conviction that there is no wire rope cure-all—no one design of wire rope suitable for all purposes. Roebling makes wire rope of a great variety of types and designs, including Standard Right, Left, Lang, Preformed and Alternate Lays, in all degrees of rope and strand flexibility. Therefore, it is able to recommend, without prejudice, *exactly* the rope needed for each individual use.

JOHN A. ROEBLING'S SONS CO., TRENTON, N.J.

Wire • Wire Rope • Copper and Insulated Wires and Cables
Welding Wire • Flat Wire • Wire Cloth and Wire Netting

Branches in Principal Cities Export Dept.—New York, N.Y.

JOHN A. ROEBLING'S SONS COMPANY

And

THERE was plenty of snow in Colorado last winter, and Wolf Creek Pass, on U. S. Route 450, received an ample share.

Drifts—slides—thaws and freezes—piled the pass with 14 to 30 feet of a packed mixture of snow, ice, earth and rocks—14 miles of the worst drifts known in 50 years.

The Colorado State Highway Department sent out a call for equipment.

Cletrac 80 Opens the Pass

But before any other equipment could get under way, a big Cletrac 80, pushing a Sargent Plow, had the pass open.

You can't lick 30 feet of snow at one plowing—you must peel off a layer at a time. Only a crawler tractor can do this—can apply enough power, without rooting into the snow below.

The Cletrac outfit peeled off a 5-foot layer each trip. Five feet is a lot of snow. It takes power to plow it, especially when there are several ice crusts. But, due to the Cletrac Crawler principle, plenty of power was available without burying the tractor.

The Cletrac did its job and Wolf Creek Pass was opened for the first time before the winter snow had melted. As a result the Cletrac was sold and delivered to the Colorado Highway Department.

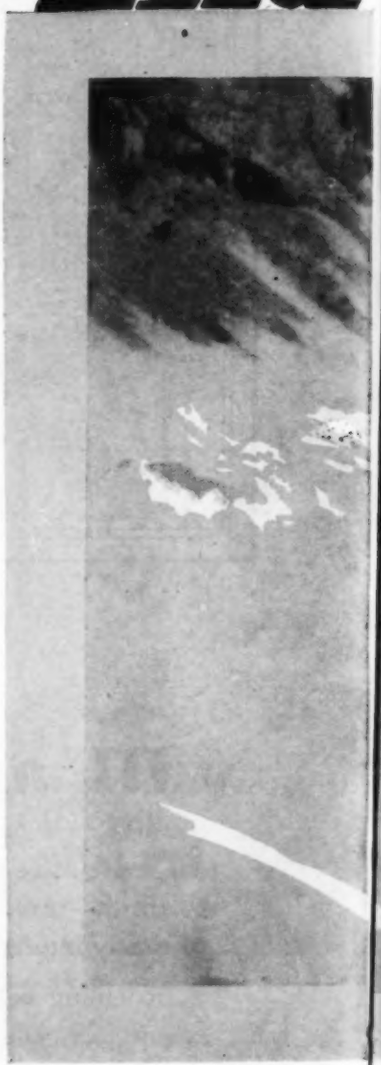
▼ ▼ ▼

YOU may not have to deal with 30-foot drifts. But any kind of snow removal requires equipment with power and endurance.

If you have Cletracs fitted with proper plows—you know you are ready for anything—ready to clear light and heavy snows promptly with a minimum of expense.

And Cletracs are useful the year around. The same crawler principle is just as necessary for heavy pulling in swamps, mud and rough areas.

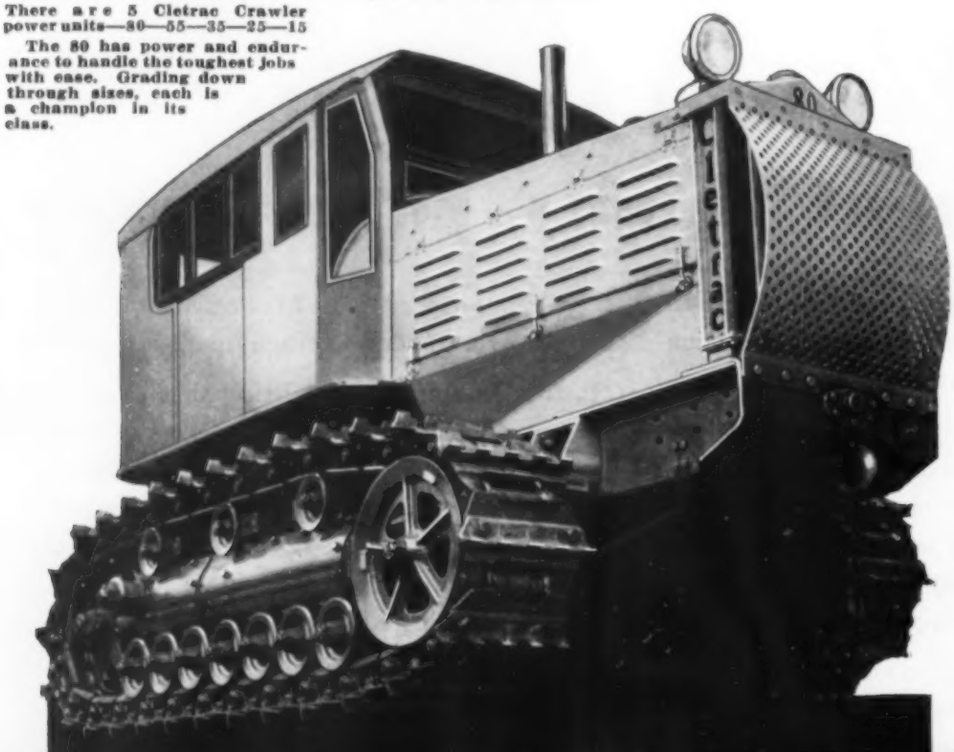
Send for further information on snow removal and general work.



CLETRAC — 17.75 TO 83 DRAW-BAR H.P.

There are 5 Cletrac Crawler power units—80—55—35—25—15

The 80 has power and endurance to handle the toughest jobs with ease. Grading down through sizes, each is a champion in its class.



The Cleveland Tractor Co.

19319 EUCLID AVE. CLEVELAND, OHIO

CLETRAC
REG U S PAT OFF
CRAWLER TRACTORS

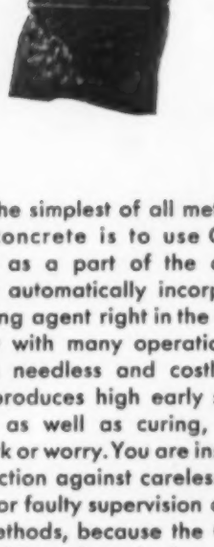
l then it snowed

The Cletrac is going after the road—peeling off the first 5-foot layer from the 30-foot drift. Note the tractor isn't buried, but is riding over the top—due to the crawler principle.

There's a road under here—about 30 feet down on the high side—14 feet on the low side.

The last cut—the top man is on the original surface of the snow.

Cure your pavements with CALCIUM CHLORIDE



One of the simplest of all methods of curing concrete is to use Calcium Chloride as a part of the concrete mix. By automatically incorporating your curing agent right in the mix you do away with many operations that are both needless and costly. This method produces high early strength concrete as well as curing, without extra work or worry. You are insured of full protection against carelessness of laborers or faulty supervision of many curing methods, because the Calcium Chloride integral method needs no additional labor or inspection.

The use of Calcium Chloride applied on the surface of the concrete has been proven to insure entirely satisfactory curing. This method does not increase the rate of set as is the case when Calcium Chloride is incorporated in the mix, but it does provide sufficient moisture for maximum hydration and insures full protection to the concrete during setting. One man will easily handle the curing for a large paving project.

Either method of curing with Calcium Chloride leaves the pavement surface in a clean and sightly condition.

IN THE MIX

ON THE SURFACE

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MICHIGAN ALKALI COMPANY
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THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

THE COLUMBIA ALKALI CORPORATION
BARBERTON, OHIO

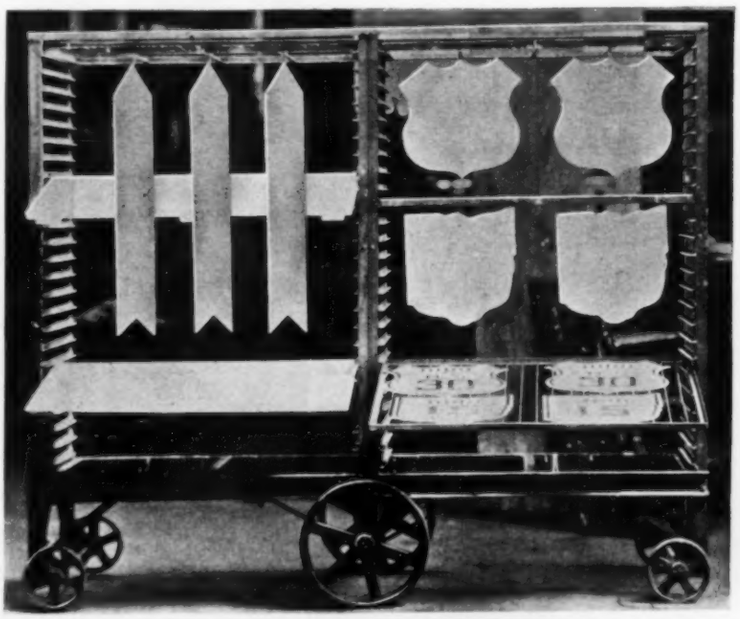
CALCIUM CHLORIDE
FOR MODERN CONCRETE CURING

Construction Methods

ESTABLISHED 1919—MCGRAW-HILL PUBLISHING COMPANY, INC.

ROBERT K. TOMLIN, *Editor*

VOLUME 14 NEW YORK, OCTOBER, 1932 NUMBER 10



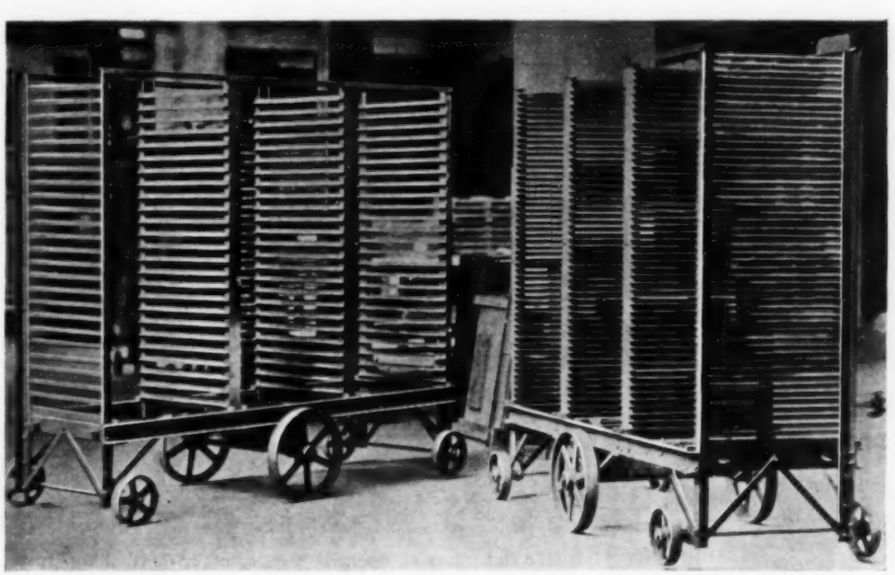
FLEXIBLE ARRANGEMENT of all-steel rack truck provides for signs of various shapes and sizes. Trays are designed to permit air circulation.

RACK TRUCKS *Conserve Space in Baking Highway Signs*

A MODERN and up-to-date sign and paint shop at Columbus enables the Ohio department of highways to maintain its reputation for a well-marked road system. Since 1921, the department has gone forward with the work of manufacturing its own signs with the result that today it has a complete and modern highway sign and paint organization. In meeting manufacturing difficulties for which it could find no precedent, the department had to originate many pieces of equipment to produce the desired results. One such piece of equipment is an all-metal paint rack mounted on wheels which is used in connection with the baking of enameled signs or route markers. The capacity of the rack is flexible, being arranged to accommodate 48 20x24-in. signs, 192 black route markers, 240 white route markers, or 120 dipped arrows.

To bake enameled signs or route markers, the rack is loaded with freshly painted signs at the spraying booth and is pushed into a thermostatically controlled gas oven with a temperature of 175 deg. F., or more, depending upon the color and type of signs being dried. A second coat of paint is baked in the same manner. The oven accommodates two trucks and is equipped with a recording temperature chart. Completed signs may bear any one of 35 different legends which the department uses in marking the highways.

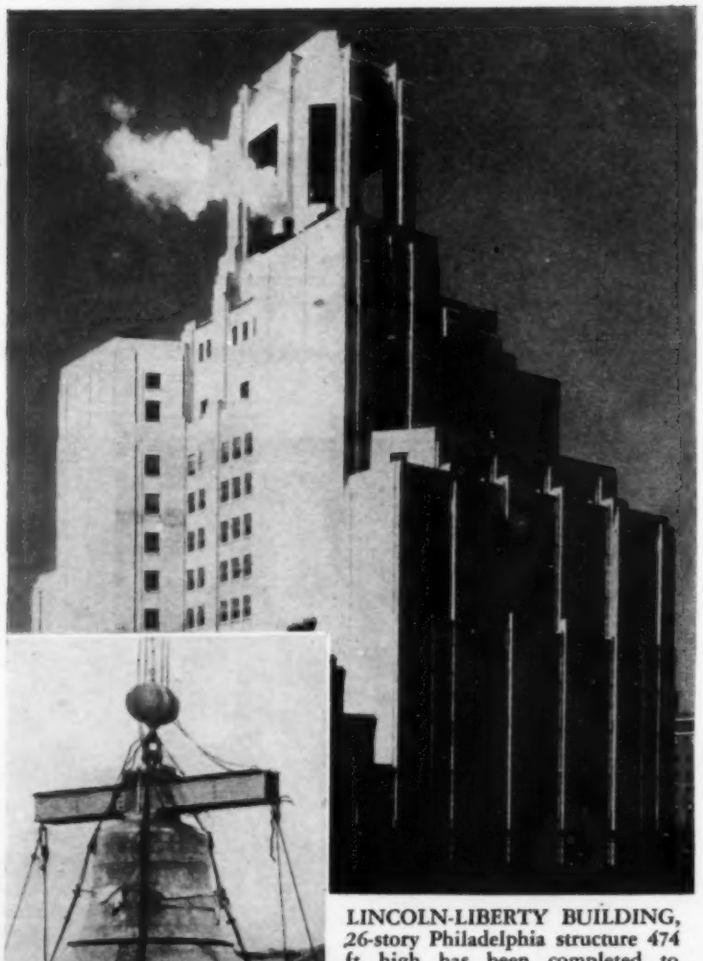
Prior to the introduction of rack trucks and a baking oven, freshly painted signs were placed on edge and allowed to dry at atmospheric temperature. This slower method did not produce the hard, durable coating which is now obtained by baking.



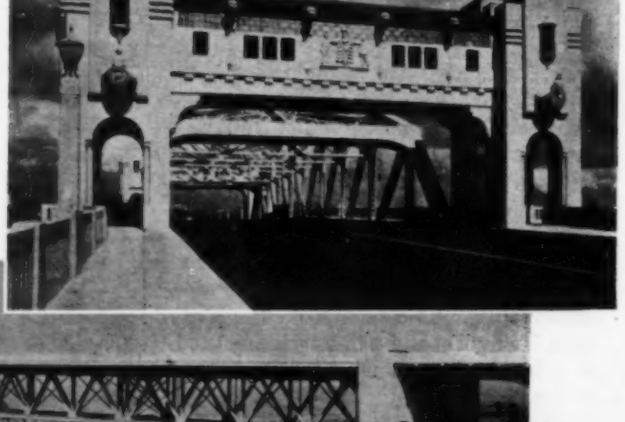
TRUCKS OF DIFFERENT CAPACITIES. Truck at right has closer shelf spacing to take twice as many signs as truck at left, used for thicker wood signs.

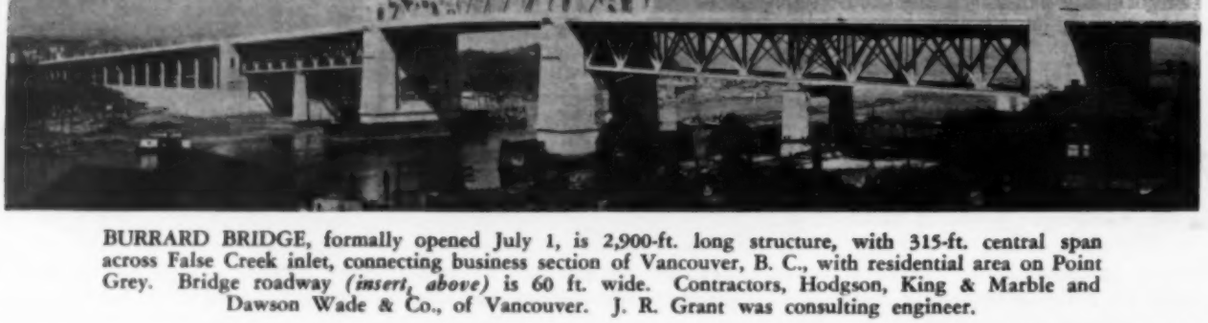
This Month's "News Reel"

PRIZE DESIGN ELEVATED TANK, with a capacity of 300,000 gal., has been erected at Towson, Md., by the Water Department of the City of Baltimore. This form of tank received the first award in an international competition sponsored by the Chicago Bridge & Iron Works which received the contract for building the structure illustrated.



LINCOLN-LIBERTY BUILDING, 26-story Philadelphia structure 474 ft. high, has been completed to house new John Wanamaker men's store on lower eight stories. Offices will occupy remaining floors. Clock tower with bell *(left)* weighing 19 tons, is memorial to Philadelphia merchant by his son, Rodman Wanamaker. Building contains underground street. Contractor, John N. Gill Construction Co.

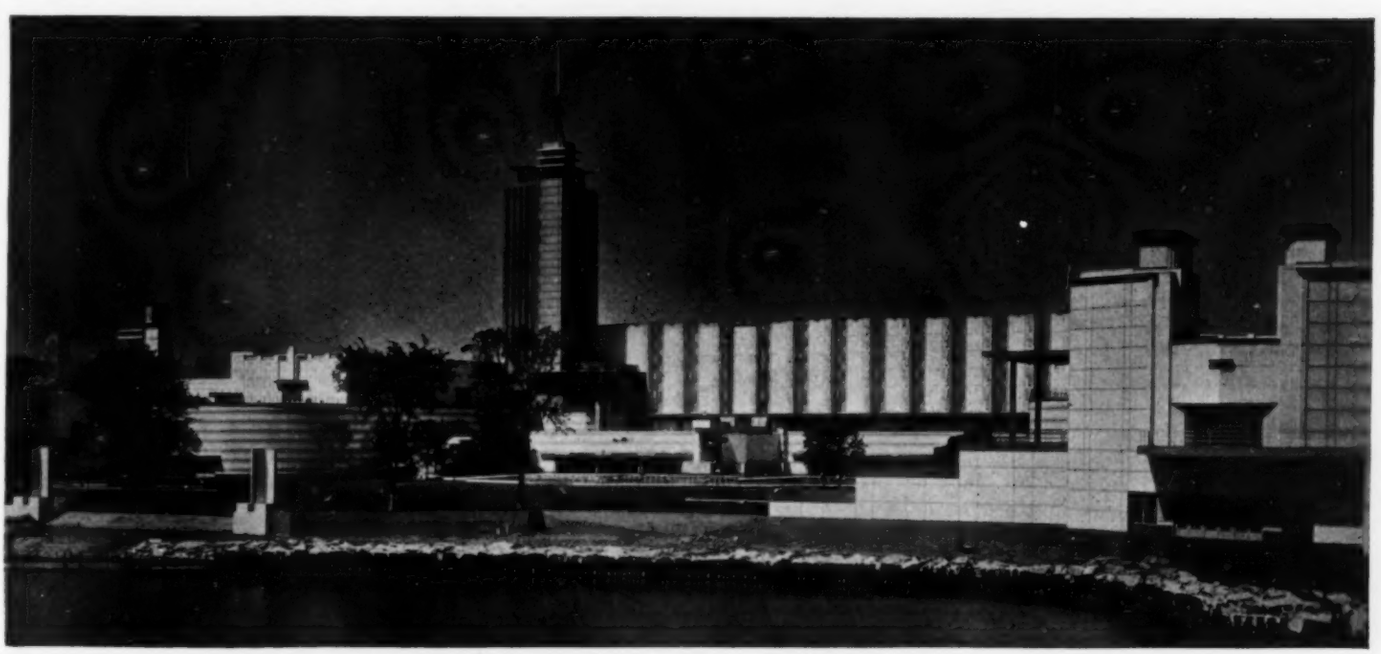




BURRARD BRIDGE, formally opened July 1, is 2,900-ft. long structure, with 315-ft. central span across False Creek inlet, connecting business section of Vancouver, B. C., with residential area on Point Grey. Bridge roadway *(insert, above)* is 60 ft. wide. Contractors, Hodgson, King & Marble and Dawson Wade & Co., of Vancouver. J. R. Grant was consulting engineer.

CHANNEL IMPROVEMENT for flood control on Great Miami River at Hamilton, Ohio, requires removal of 400,000 cu.yd. of sand and gravel. Ward-Hayes Construction Co. is using 2-yd. Link-Belt dragline to clean out material from river bottom and transfer it by industrial railway for use as highway fill. The work is under the diection of C. H. Eiffert, chief engineer of the Miami Conservancy District.

OWYHEE DAM *(left)*, 530-ft. high concrete structure for U. S. Bureau of Reclamation project in Oregon, has been completed by the General Construction Co., of Seattle. Method of construction involved placing of concrete by cableway and 8-yd. bucket.



HALL OF SCIENCE, designed by Paul Philippe Cret, of Philadelphia, is ready for Chicago's Century of Progress Exposition next year. U-shaped structure, with windowless walls, is 700x400 ft., with court-yard accommodating 1,000 people. Tower 176 ft. high, is equipped with carillon.

Helps to Successful Contracting

First of a series of articles on applying business principles to construction and making profits by avoiding costly mistakes

By HARRY O. LOCHER

Formerly Associated with Winston & Co., and Locher; Grant Smith & Co., and Locher; Johnson, Locher & Co.; and Frederick L. Cranford—Charles H. Locher, Inc.

1—Shall I Bid?

A FEW years ago a large contract was advertised for bids. It was the second section of a project on which the first was about completed. The two sections were identical in character of work. It seemed that there was little chance for this second contract going to any other than the contractors who built the first. With splendid plant and equipment right on the ground, an experienced organization ready to carry on, and with an intimate knowledge of the character of the work and its exact cost, it seemed they were in an unbeatable position. But an outside concern, from several states away, beat them nearly a million dollars.

How? First, by taking a logical view of what the real situation was. With keen insight they guessed at just what went on in the original contractors' minds. Very likely this was about as follows: "Here we are, equipment and trained organization on the ground, in possession of experience and dependable costs. All this is worth a great deal to us and we will allow for it. Our position is unbeatable."

But what spoiled this pretty picture was that they failed to analyze what was going on in possible competitors' minds. The successful bidder very likely reasoned in this manner: "This outfit on the adjoining job thinks it is sitting pretty—that it has a tremendous advantage over all outsiders. Its confidence will go too far and this will let us in under the wire if we handle things just right."

They did. They shopped round and got amazingly low prices on all materials needed. They drove a hard bargain for the large amount of power required. They took every advantage of savings in the general price decline and, after being low bidders, it seemed ironical that they purchased from the original contractors much of their plant and equipment at most advantageous prices.

PRACTICAL ADVICE FROM A PRACTICAL MAN

THIS SERIES of articles contains a wealth of practical advice from a practical man, with a background of long and successful construction experience.

* * *

• Harry O. Locher, graduate of Virginia Polytechnic Institute and member of the American Society of Civil Engineers, started in the construction business 31 years ago as a timekeeper on the Weston Aqueduct in Massachusetts. From there he went to the St. Mary's River on channel construction and then down on the Mississippi, building levees for flood control.

• The year 1908 found him construction manager on the Shoshone dam in Wyoming. Then to the Denny Hill regrade work in Seattle. Succeeding jobs, where he served as superintendent and managing partner, included the Santa Maria dam, in Colorado; concrete piers in San Francisco harbor; hydro-electric development in New York; the New York Barge Canal; and New York City's new subway system.

• His construction duties have been supplemented by a wide experience in purchasing, installing and selling construction equipment, and in selecting and organizing construction personnel.

"Scared Off"—Quite a number of contractors were anxious to land this particular piece of work, but in going over the various phases of the situation, in trying to determine, "Shall we bid?" they concluded that the contractors on the ground were so situated and had such advantages that it was futile to compete with them. Situations of this sort have happened again and again. Sometimes, it is true, the low bidder overplays his hand and meets disaster, but acumen and daring often reward him well.

The foregoing has been told to bring out the fact that before being "scared off" by certain situations that would seem to make bidding on certain contracts futile, it is well to analyze every phase as thoroughly as possible, particularly that phase which, on first thought, would seem to put all but a certain contractor out of the running. Usually some far-seeing, quick-thinking daring contractor walks off from such a situation with the prize. However, there are, at times, situations in which certain favoritism cannot be beaten—usually it is associated with "dirty" politics or the inner workings of certain interests. When such conditions are known to exist it is but good judgment and self respect to keep away from the nasty mess.

Favoritism—In a certain city bids on a large bridge were advertised. One of the contractors who took out bids was approached and told he had better "lay off" this particular job. He bristled up; told the emissary where to go, and that no man alive could tell him when or where he would bid. After being low on the contract he was again approached and told it might be well if he made certain contributions. This time he exploded and let loose a broadside at the emissary that was fairly shattering. But this gentleman was not in the least perturbed. He bid the "old war horse" a pleasant good day, departed, and was seen no more.

The work had hardly started before things began to happen. If there ever were specifications written that the contractor was forced to live up to—or made to attempt to live up to—these were the ones, to the crossing of the last "t" and the dotting of the last "i." Unbelievable and utterly impractical and impossible things were demanded: Reinforcing bars had to be set almost with calipers. Almost ideal grading was demanded in concrete aggregates. Pile locations meant "pile locations," and variations of infinitesimal proportions were "slovenly" work, and "flagrant" disregard of the specifications. The contractor carried on until the burden became too great and the loss more than he could bear. By this time, realizing the hopelessness of his situation, he gave up and agreed to the assignment of his contract.

The new contractor breezed along

as unhampered as water over Niagara and completed the work to the satisfaction of "all concerned." But it dramatically and tragically ended the career of the man who tried to beat an unbeatable game. Of course, this was an unsavory situation, and it is true, too, that a man of very strong character and ample funds might have been able to beat it. But, until there is concerted and united action against such practices, it is but prudence and common sense for a contractor not to place himself in the role of a lone crusader. So, in "Shall I bid?" avoid situations in which favoritism appears to be the controlling factor.

Adequate Funds—A great many contractors underestimate the amount of money necessary to carry on work until it is productive enough to carry itself—and there are innumerable instances where this point is never reached. It is no uncommon thing for contracts running into millions of dollars to be entirely completed before the use of the profit in them is available. This is equally true in many, many small contracts. Many opportunities to earn a profit have been lost by neglecting to consider the financial requirements at the start.

To be safe, unhampered and unrestricted in the carrying out of his contract in the most efficient and economical manner and, of course, with the hope of the maximum profit, a contractor must have, or control, adequate funds. On a given piece of work, as between a well and poorly financed contractor, it is quite possible for the former to earn a profit and the latter to suffer a loss. Of course, some men possess more ingenuity and resourcefulness in the use of their funds than others, but in the long run the regular old John Henry is better to count on than ingenuity and resourcefulness of the unusual sort. It is a common formula that there should be in hand at least ten per cent of the amount of the the contract in cash or its equivalent. Very seldom is less needed and most of the time more. If an experienced contractor is completely honest with himself he can come pretty near to the amount needed by careful figuring—if he doesn't overlook the fact that most everything costs from one-fourth to as much again as most "hopeful" figures show. "Hopeful" figures invite disasters. Be guided by past experience and naked facts. Do not put dependence in "breaks" unless you can see through them to the end. More about this when we discuss costs.

HARRY O. LOCHER

When it is determined just how much money is needed before bidding on certain work the thing to do is to provide it. Of course, if it is in hand there is no more to it. If it is not, or only partly so, it should be made definitely available before submitting a bid. If a financial statement is required it should be willingly given, and it should show a true and conservative picture of the contractor's real condition, even though any credit extended may not be based entirely on what the statement shows.

Some contractors in tight places and badly in need of funds are tempted to, and do, make statements that are gross misrepresentations. Of course, they do not always get by with them. Even if they do, it is only a temporary advantage. Almost without exception, if misrepresentation is found out, reputation has suffered a loss which it seldom regains, and lack of confidence in a man is a burden and a penalty for which he pays in some way, every day of his life. So, in dealing with bankers, backers, or anyone assisting with funds, there is only one course to pursue—that of complete frankness and honesty.

It is far better judgment to take on the amount of work you know you can comfortably finance, than to tackle larger projects about which there is some doubt of your financial ability to swing. Often your chances for profit are better on the smaller work, as you are not constantly incapacitated and harassed and hampered over financial

difficulties. There are too many tragic business stories with "shoe string" or inadequate financing as their basis.

Surety Bonds—The matter of surety bonds is extremely important. It has sometimes happened that an overzealous surety bond company or broker has procured surety for contractors for whom it was no help, as subsequent events showed. If a reputable surety company questions the writing of a certain contract bond, it will be good judgment, indeed, for the contractor to look carefully over the bid figures again to discover if they are the cause of the objection or to seek additional financial strength, in case the surety objects on that score. After a contract has been awarded is no time to begin arranging for contract bonds, unless, of course, the concern is well established and strong. Then the matter of surety bonds is only a formality. Nowadays, however, there are a great many who used to be on the formality list, who have to bring in the figures for a surety company's "O. K." before submitting a bid. In fairness, it must be said that there are some very capable surety bond brokers who can sometimes arrange for a bond for a contractor who is entitled to it, where otherwise, due to his lack of knowledge of presentation of his case, he might not be able to secure a bond.

"In these days of rapidly evolving and improved equipment the contractor who goes out and buys a spanking new machine may have a real advantage over a competitor who has a 1926 model in hand."

Equipment on Hand—Having certain equipment on hand is sometimes a factor in whether or not to submit a bid, but, perhaps, not as much so as formerly when we take into account the equipment rental situation and the tremendous amount of idle used equipment throughout the land. Knowing the terms at which some manufacturers put equipment into contractors' hands these days, the advantage of ownership of certain equipment is open to question. In the final analysis, equipment costs so much to operate and own; and if it's equipment you have owned for some time, or have recently acquired, owning and operating costs are the same, or nearly so. In these days of rapidly evolving and improved equipment, the contractor who goes out and buys a spanking new machine may have a real advantage over a competitor who has a 1926 model in hand. Of course, there are certain and special cases that influence this situation and having equipment in hand is an advantage!

Summing up, it is well before giving too much weight to equipment in hand, to go into the situation in a most thorough manner. It may be discovered that you are at a disadvantage, rather than in an advantageous situation, by expecting to use certain equipment because you have it in hand. It has sometimes happened that certain situations in connection with a contract have been made to appear as difficulties, and magnified as such away beyond the real truth. Usually it's a smoke screen, and usually, too, it's a good piece of work which certain parties are trying to limit the competition on. Unless it is something peculiarly local, special difficulties and conditions should be as evident to one experienced contactor as another. Noised about difficulties are generally not worth paying any attention to. Again, a lack of interest is sometimes expressed by competitors when certain work is up for bids. For instance: "It will go so cheap there is no use wasting time on it; there will be so many bidders we won't have a chance; so-and-so has the equipment right in hand and can't possibly be beaten," and on and on. As a matter of fact, all of these arguments are being refuted every day. The latter argument mentioned above was knocked into a cocked hat a short time ago. A certain contractor had to move his equipment literally from the site to make room for identical equipment which another contractor was bringing in from nearly 2,000 miles away.

Possible Competition—It is often a source of valuable information to find out accurately, if possible, who have taken out plans. A certain contract was to be let. It adjoined a contract on which two large contracting firms were working, one of them subbing a large amount of the work from the other. They were both eager for this new work which they knew was most desirable.

NEXT MONTH—In the second installment of this series Mr. Locher will discuss: "What the Contractor Should Know About the Job Before Bidding." His advice will cover such matters as studying the contract and specifications, examining the site of the work, and finding out what possible competition may develop.

A few days before the opening the subcontractor took out plans, specifications and bid sheets through a stranger. Also, he approached the general contractor for an advance, saying he was hard up and in need of funds. Both of these moves completely disarmed the most logical competitor. The subcontractor was ignored entirely and when the bids were opened he nosed out the general contractor, so adroitly and perfectly honestly had the whole thing been carried through.

Experience—It almost goes without saying that a contractor should have experience in the work on which he expects to bid. If he has had no personal experience of his own he should consult not one, but several, competent authorities on the work he expects to bid on. Generally, though, a contractor's own experience is his best guide, and over a period of years he will come through better if he confines himself to work with which he is personally familiar. There is nothing so valuable as your own experience. Too few realize this. This is not to say that one should not delegate responsibility and authority, but that he should delegate it in directions in which he himself has traveled.

"A great many contractors underestimate the amount of money necessary to carry on work until it is productive enough to carry itself. . . . . A contractor must have, or control, adequate funds."

In certain instances, mostly known in advance, it is well not to deposit a bid until just before opening time. All sorts of things may occur in the last half hour or so: revised prices on something may reach you; it may become known that certain close bidding competitors would not be there; a subcontractor may make you a lower price on some item.

Occasionally, there may be collusion, or something of the sort, which only a last minute depositing of the bid will circumvent.

In "Shall I bid?" there are many things to be considered and weighed carefully. The prudent contractor, over a long period, will find himself a substantial gainer if he deliberately considers whether or not he should bid. If he does bid, he must carefully consider all the factors for and against him. Hastily and superficially throwing together a bunch of figures, or depending upon an estimate, is not intelligent bidding. It's a mere trusting to luck to get the contract and then to earn a profit on it.

Bidding is the most vital and important part of a contractor's business. A most successful contractor used to say, "If bidding is carefully and properly done, every now and then you'll land a good job, and over a period of years, you'll make money." The results of his career are definite proof of the soundness of this method.

(To Be Continued)

ELECTRIC SHOVELS
Handle Tunnel Muck at Hoover Dam

By R. W. McNEILL
Electrical Engineer,
Westinghouse Electric & Manufacturing Co.

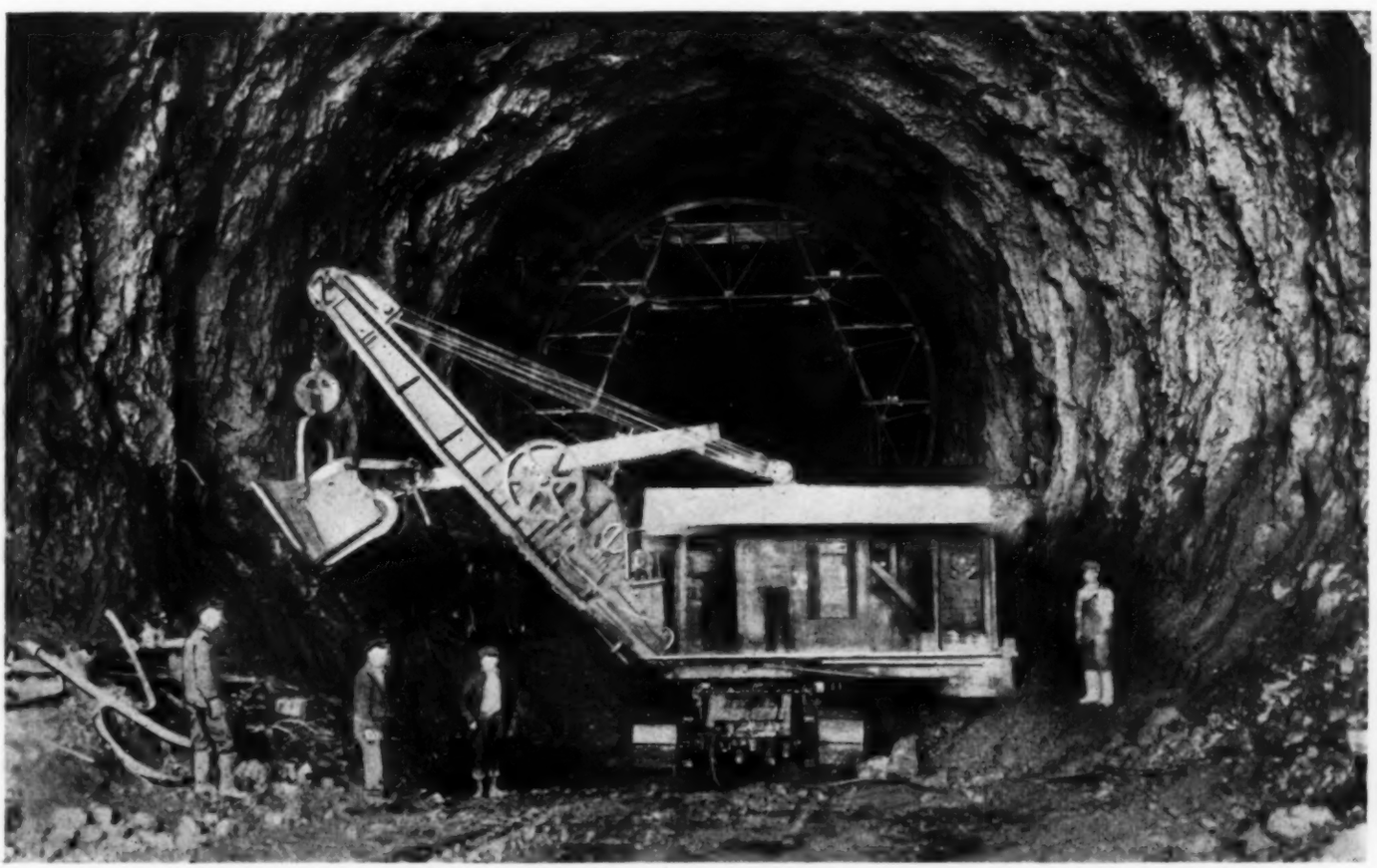
FOR mucking the four 56-ft. diameter rock tunnels, each about 4,000 ft. long, which will divert the Colorado River around the Hoover dam during construction, Six Companies, Inc., the contractors, are using electric power shovels to load spoil into motor trucks for removal to dumps. Electric shovels for this purpose have the following advantages: They impose no additional ventilation problem of exhaust gas removal; they are obtainable in sizes suitable for handling the exceptionally large-scale operations involved; they offer substantial operating economies, inasmuch as electric power delivered to the damsite by a newly constructed 230-mi. transmission line is available under a contract entered into by the U. S. Bureau of Reclamation with the Nevada-California Power Co.

Methods of driving the diversion tunnels were illustrated and described in detail in the August number of *Construction Methods* (p. 24). Briefly the operation involved, first, the excavation of two 10x8-ft. adits extending in from the canyon walls, one on each side of the river, to intersect the top arc of each main tunnel about half way between its upstream and downstream portals. These adits opened up for attack eight rock faces in addition to those that could be worked from the eight portals. Largely from these adits 12x12-ft. pioneer top headings were advanced for the full length of each tunnel. Then each bore was enlarged to its full 56-ft. circular section by removing, first, sector-shaped wing sections (one on each side of the pioneer heading); second, the main 30-ft. high bench section; and, lastly, an invert section having a maximum depth of about 14 ft.

Adits and Top Headings—On the preliminary tunnel operations for the adits and the pioneer headings, muck was handled by Conway electrically-driven mucking machines, which combine a conveyor belt with a digging dipper, and are designed for work in close quarters. The machines operated on a 42-in. gage track and each was driven by a 50-hp. 1,150-r.p.m., 3-phase, 60-cycle Westinghouse linestart squirrel-cage motor. The conveyor belt operated continuously while mucking. Friction clutches provided for independent manipulation of the dipper and backward and forward movement of the whole machine for digging the muck and placing it on the conveyor belt, which discharged into a 3½-yd. Western dump car coupled to the mucker while being filled.

Electric control of the mucker motors was of the simplest type, consisting of a three-pole non-fused safety switch, of the quick-make, quick-break type, with De-ion arc quenchers.

Power was supplied to the mucker through a three-conductor trail cable. Overload protection for this cable and



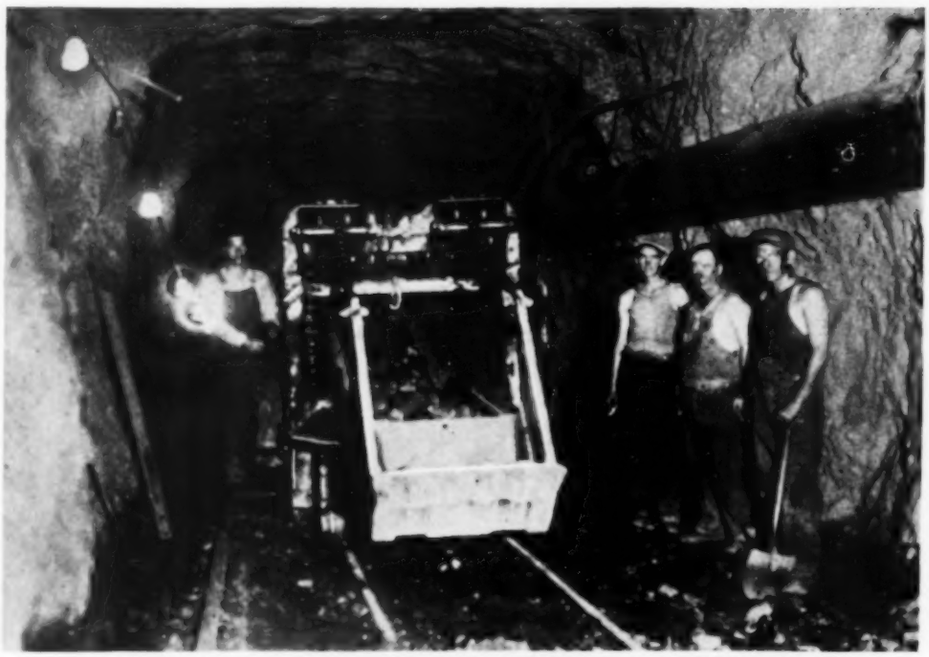
EQUIPPED WITH 3½-CU.YD. DIPPER, electric power shovel on crawler mounting removes muck from invert of one of the four 56-ft. diameter diversion tunnels. Spoil is loaded into motor trucks for removal to dumps.

the mucker motor was furnished by an oil circuit breaker, where this trail cable joined the main 440-volt buses in the heading.

The driving of the 12x12-ft. top headings speeded up the work by providing ventilation and convenient access for the enlarging operations which were to follow, and also furnished accurate information on the character of rock to be found throughout the length of the tunnels. By driving the adits, eight faces were opened up for attack, in addition to those at the portals. Actually the bulk of the footage in the top headings was driven from the adits.

Main Tunnel Enlargement — Considerable open cut excavation was necessary in gaining access to the portals of the diversion tunnels, for enlarging purposes. The lower portal of diversion tunnel No. 4 was ready first, and enlarging operations started there Sept. 21, 1931. Marion Steam Shovel Co., Model 490, 100-ton electric shovels, which had been selected previously as best suited for the tunnel enlarging operations, were used in the open cut work. These shovels came on to the job equipped with 2¼ yd. heavy rock dippers, but after some experimenting 3½-yd. dippers of somewhat lighter construction were installed by the contractors.

The electric equipment on these shovels is of Westinghouse design and makes use of the variable voltage system of control on the main motors. Power is brought to the shovel through a 2,300-volt trail cable, and, after going through an oil circuit breaker, passes directly to the 125-hp., 1,750-r.p.m., 2,200-volt, 3-phase, 60-cycle induction motor, which drives the main four-unit motor-generator set on the rear of the shovel. Transformers are used to step the 2,300-volt power down to 440 volts, for use on the auxiliary equipment on the shovel. These auxiliaries consist of a 5.5-kw., 125-volt d.c. exciter motor-generator set, a 15 cu.ft. air compressor, and blower motors for ventilating the main motors.



ELECTRICALLY DRIVEN MUCKING MACHINES, equipped with dippers and belt conveyors, handle rock in close quarters of adits and pioneer top headings.

The main hoist motor is of the series type rated at 75 hp., 475 r.p.m., 230 volts d.c. Power is supplied to this motor by a 60-kw., 1,750-r.p.m., 250-volt differential compound-wound d.c. generator. The swing and thrust motors are duplicates electrically and are rated at 28¾ hp., 600 r.p.m., 230 volts. They are of the shunt-wound type with separately excited fields. Power is supplied to these motors from two 22½ kw., 1,750-r.p.m., 250-volt differential compound-wound d.c. generators. Natural ventilation is used on the main motor generator set and forced ventilation by means of small individual motor-driven blowers on the hoist, swing and thrust motors.

A small d.c. torque motor operated from the exciter circuit furnishes power for automatic dipper tripping. Controllers are all of the vertical handle type, with easily renewable wearing parts. A thumb-operated switch is provided on one of the controllers for operation of the dipper trip device.

Six Companies, Inc., have nine of these Marion shovels, eight of which are used on the tunnel enlarging operations. Table No. I gives the record of eight of these machines:

The average of 121 cu.yd. (solid measure) per digging hour is relatively high when consideration is given to the fact that all material was loaded into trucks and the small working space made it necessary that the loaded muck get out of the way before an empty truck could be backed in to receive its load. Individual performances were as high as 200 cu.yd. per hour, and dur-

OPEN CUT EXCAVATION for grading railway and highway routes along Colorado River Canyon was also handled by 3½-yd. electric shovels, loading into steel-bodied motor trucks.

LARGE-SIZE DIPPERS *(left)* of 3½-cu.yd. capacity, were substituted for the smaller 2¼-yd. dippers with which the shovels were originally equipped. Power is delivered to the shovel by a 2,300-volt trail cable.

Table I—Excavation Record of Electric Shovels at Hoover Dam Diversion Tunnels

Month 1931	No. of Shovels	Shovel Hours	Digging Hours	Cu. Yd. Excavated (From solid)	Cu. Yd. Per Shovel Hour	Cu. Yd. Per Digging Hour
Oct.	2	824	490	46,080	56	94
Nov.	4	2,440	953	119,075	49	125
Dec.	7	4,336	1,967	250,395	58	127
1932						
Jan.	8	5,928	3,051	442,478	75	145
Feb.	8	2,384	1,290	127,548	53	99
Mar.	8	4,832	2,152	218,390	45	101
Apr.	5	3,416	1,181	130,480	38	110
May	5	1,424	501	62,480	44	125
		25,584	11,585	1,396,926	55	121

Table II—Performance of Electric Dragline

Month 1932	Shifts	Hours Actual Digging	Total Production Cu. Yds.	Cu. Yd. per Hr. Actual Digging Time
Mar.	91	630	188,000	298
April	85	496	160,000	322
May	92	528	176,000	333

ing January, 1932, as much as 16,000 cu.yd., solid measurement, were removed daily from the tunnels, and trucked to spoil dumps. Power consumption is estimated from test readings at 0.3 kw.-hr. per cubic yard.

In addition to the nine Marion shovels, Six Companies, Inc. have in operation, at the Arizona gravel pit, one Marion class 125 dragline, with 5-cu.yd. bucket. This machine, like the shovels, is equipped with Westinghouse electrical equipment for operation on the variable voltage system, from a 2,300-volt supply circuit

This dragline has a big job ahead of it, in digging the aggregates for the more than 4,400,000 cu.yd. of concrete which will go in to the Hoover dam and appurtenant works. Table No. II gives the performance of this machine to date.

With favorable digging conditions the machine has loaded ten-car trains (350 cu.yd.) in less than 40 min., or at the rate of more than 500 yd. per hour. Power consumption averages 0.4 kw.-hr. per cubic yard.

Excavation of the main diversion tunnels was completed in May. At the present time, three of the type 490 shovels are at work on spillway excavation and on road work. Two more may be used in the penstock tunnels this fall. Other work before these shovels consists in digging the necessary material for the cofferdams excavating for the main dam foundation.

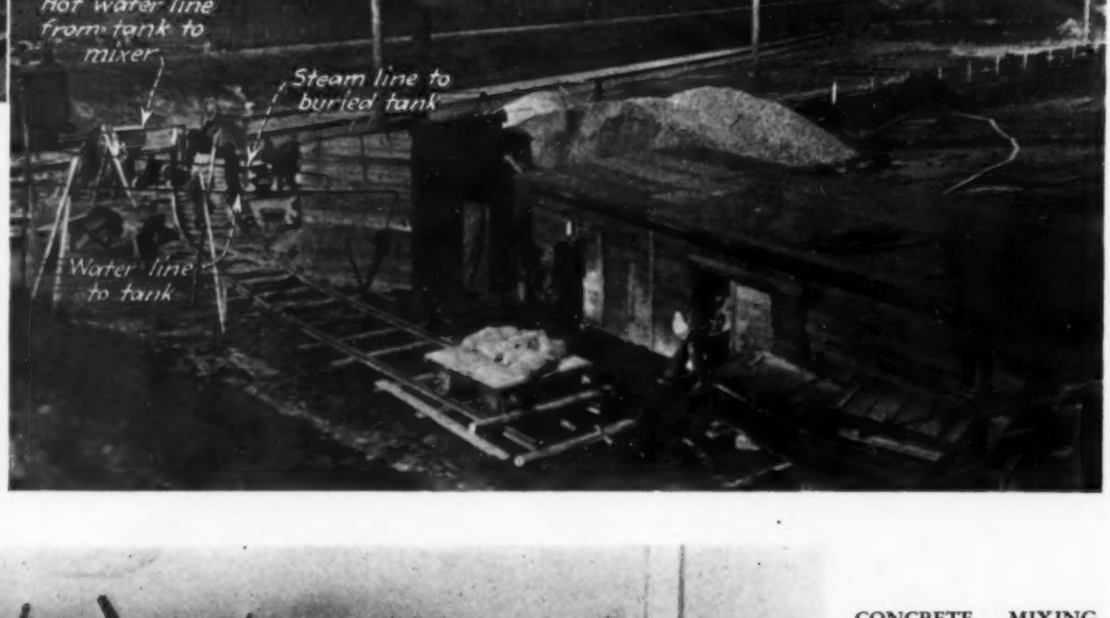
ELECTRIC DRAGLINE with 5-cu.yd. bucket, operates in pit on Arizona side of river to supply gravel aggregate for concrete mixing plant. This machine has loaded trains at rate of 500 yd. per hour.

WINTER CONSTRUCTION *Provides*

FLEXIBLE STEAM SYSTEM *protects concrete at grade separation bridge*

A FLEXIBLE steam system made up of two self-sufficient units which could be connected to draw steam from three boilers in event of extremely cold weather served the Jones Contracting Co., of Pontiac, Mich., in constructing for the Michigan state highway department a grade separation bridge on the Square Lake road across the Grand Trunk Western tracks 2 mi. southeast of Pontiac. Contract for the work, awarded to the Jones Contracting Co. early in November, 1931, specified a completion date of

LOCOMOTIVE CRANE places concrete by bucket in pier forms protected by steam-heated housing. When necessary, crane boiler can be connected to job heating system to supply additional steam.



CONCRETE MIXING PLANT has 25-hp. boiler which heats aggregates and water in elevated tank buried in hill to left. **GRADE SEPARATION BRIDGE** *(left)* has three skeleton piers and two counterfort abutments. In foreground is shanty for contractor's watchman who warns workers of approaching trains.

Work Relief

June 15, 1932, and required that the contractor conduct operations in such a way as to afford the maximum employment practicable, particularly up to April 1, 1932. By this date the contractor had placed practically all substructure concrete, amounting to 900 yd.

Design of Bridge—Included in the substructure were two counterfort abutments and three skeleton piers, with spread footings resting on sound foundations of sand and gravel. The superstructure, of the steel deck-girder type, consisted of two spans 40 ft. long, one 41 ft. 8½ in. long, and one 38 ft. 8½ in. in length. Each span had twelve 24-in. I-beam stringers carrying a 40-ft. reinforced-concrete roadway and two 6-ft. sidewalks. The roadway was on a slight skew with the railroad tracks. To retain the sand and gravel foundations lines of interlocking steel sheetpiles were driven to a depth of 5 ft. around the pier footings and to a depth of 12 ft. along one wingwall of the west abutment.

Labor requirements—Supplemental specifications for employment and use of labor on this contract were identical with those attached to proposals for all projects included in Michigan's $10,000,000 winter highway program for unemployment relief. In addition to regulations regarding the method of hiring men from the official list of unemployed, spreading the work over a greater number of men by restricting employment of any one workman to two shifts a week or to one week out of two, and paying no less than the minimum wage for common labor or the prevailing wage for skilled labor, the supplemental specifications also contained the following provisions directly affecting the work on this project:

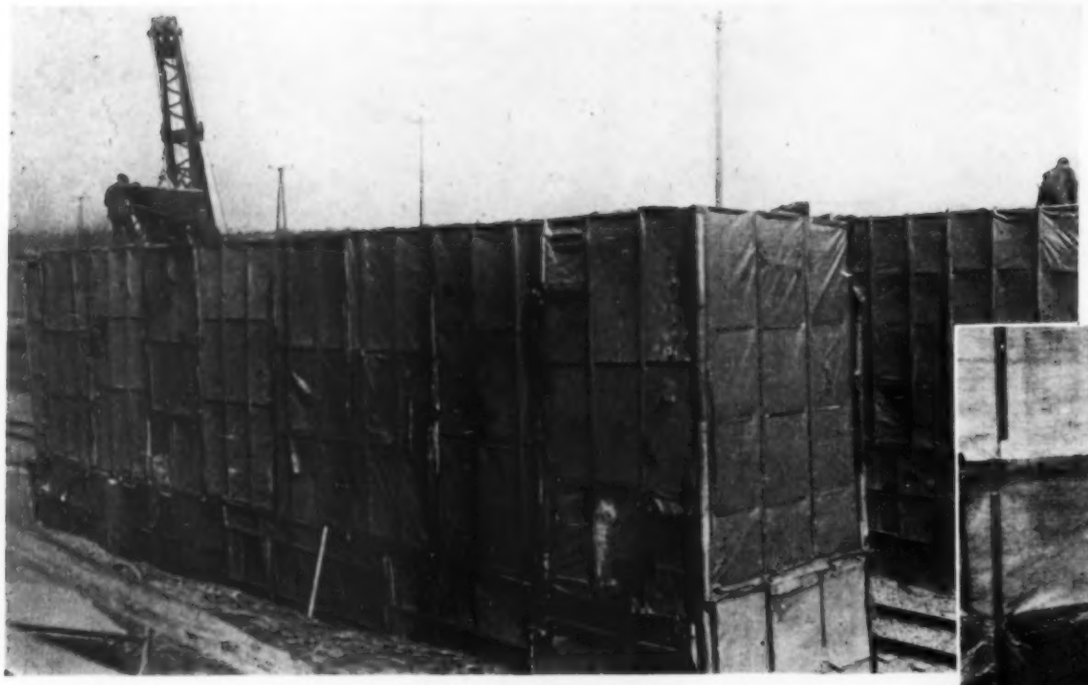
(1) All excavation and backfilling shall be done by hand shovels, team scrapers, wheelbarrows and carts.

(2) Aggregates shall be unloaded from freight cars by hand and shall be handled from the stock

CANVAS COVERS of stockpiles are removed as aggregates are used, conserving heat supplied by live steam.

GRILL OF PERFORATED PIPES *(left)* under stockpile releases live steam to heat aggregates. Canvas tarpaulins covering pile reduce heat losses.

HAND CARTS transport concrete from hopper below mixer on bank to bucket handled into pier forms by locomotive crane.



HOUSING made up of panels of building paper on wood frames protects concrete in skeleton piers during curing period.

STEAM PIPE *(below)* divides into four lines at entrance to pier housing. Petcocks on pipes release steam for curing inside inclosure.

piles to the mixer by hand shovel, wheelbarrow or carts.

(3) Cement and reinforcing material shall be unloaded and placed by hand.

(4) All carpentry work and finishing of concrete surfaces shall be done by hand.

(5) Concrete shall be transported from the mixer to its place by the use of carts or wheelbarrows.

These specifications furthermore included the requirement that all structural steel for spans up to 60 ft. in length should be placed by hand. In the proposal for this contract, however, a special clause was inserted to permit placing of girders by crane.

Steam Plant — Two steam systems operated individually under normal weather conditions. At the east end of the bridge was the concrete plant equipped with a 25-hp. boiler which heated aggregates and water and also supplied steam to one of the pier enclosures. At the west end of the structure, the contractor placed an old steam mixer solely for the purpose of using its 7-hp. boiler to cure the concrete of the west abutment and the adjacent pier. When temperatures became extreme, a third heating unit was available in the form of a locomotive crane equipped with a 45-hp. boiler. This boiler could be connected with the two individual steam systems to supply steam from the three units to whatever part of the job needed protection.

Concrete Plant—Grids of perforated steam pipes under the stock piles heated the aggregates. Feeder lines and perforated pipes were equipped with valves to direct the flow of steam to those portions of the piles which it was desired to heat. Tarpaulins spread over the tops of the piles served to retain the heat.

Live steam from the boiler heated mixer water in a 500-gal. tank. To prevent heat loss by radiation, this tank was buried in the top of an embankment from which it could deliver to the mixer by gravity. Concrete usually was placed at a temperature between 60 and 65 deg. F. Specifications permitted a maximum placing temperature of 75 deg. F.

Sand and coarse aggregate used in the concrete mix were delivered to the mixer skip in wheelbarrows. A Fairbanks platform scale equipped with four beams weighed the aggregates in the wheelbarrows on their way to the mixer. Only three of the scale beams were used; one being set at the weight of the wheelbarrow, one weighing sand, and one weighing coarse aggregates.

The mixer was situated on a bank about 8 ft. above track level. It dis-

IN CHARGE OF PROJECT. *(Left to right)* L. B. CRANE, division bridge engineer; F. W. LESTER, project engineer; E. A. NEALON, contractor's superintendent; and H. G. OAKES, division engineer.

charged into a hopper from which concrete was fed through a hand-operated gate into the carts. Pier footings were poured by dumping directly from the carts into the forms. Concrete for the abutments and for the piers above track level was placed by bucket. The carts dumped the concrete into a 1-yd. bottom-dump bucket in a pit within reach of the locomotive crane, and the crane handled the bucket into the forms. Sectional wood forms were used in the construction of pier columns and girders. Abutment wall forms were built in place.

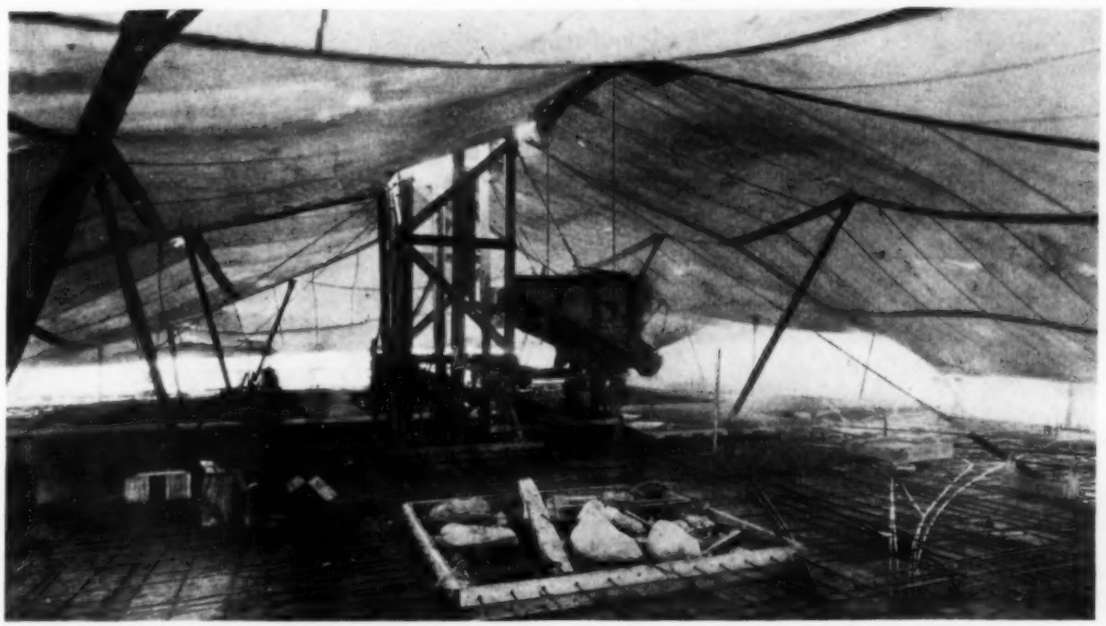
WEIGHT MEASUREMENT of aggregates in wheelbarrows is quickly made on four-beam platform scale.

Curing—Sidewalls of the housing for piers and abutments were made up of panels, about 5x10 ft. in size, consisting of Sisalkraft building paper on wood frames. These panels were attached to a framework of 2x6-in. and 2x4-in. timbers. The top of the housing was covered with tarpaulins. Steam pipes inside the inclosure were equipped with small valves to release live steam during the curing of the concrete.

The contractor carried on the work in such a way as not to interfere with train movements of the railroad or with the lowering of its operating track.

Supervision—Grover C. Dillman is state highway commissioner and Clifford E. Foster is chief engineer of the highway department. Under C. A. Melick, bridge engineer, the men in charge of the work were H. G. Oakes, division engineer; L. B. Crane, division bridge engineer; and F. W. Lester, project engineer. Frank Gurley, superintendent, directed operations for the Jones Contracting Company.

TENT HOUSING *simplifies protection of reinforced-concrete building*



TENT ROOF in four sections hung from ridge pole on central concrete hoist tower provides weatherproof cover with ample clearance for distribution of concrete. Canvas has been treated with colorless waterproofing which transmits daylight.

A CANVAS tent roof in four sections to cover floors 70x100 ft. in area greatly simplified and expedited winter construction of a six-story reinforced-concrete factory addition in Brooklyn, for which the Willcox Construction Co., of Long Island City, N. Y., was concrete contractor. Use of the tent roof eliminated the large amount of staging needed to carry the smaller canvas units commonly employed for housing on concrete buildings. The four sections of the tent, which were suspended from a central hoist tower, could be raised and spread much more rapidly than the more familiar types of housing.

An 8x8-in. horizontal timber 30 ft. long, on one side of the central hoist tower, served as the ridge pole of the tent and as a yardarm for raising the four sections after they had been furled. The canvas fitted closely around the tower and was provided with flaps which could be tied across the tower opening. Because of fumes from salamanders on the floor below, however, the tower hatch always was left open. A 1-ft. overlap covered each of the laced seams between sections of the canvas roof.

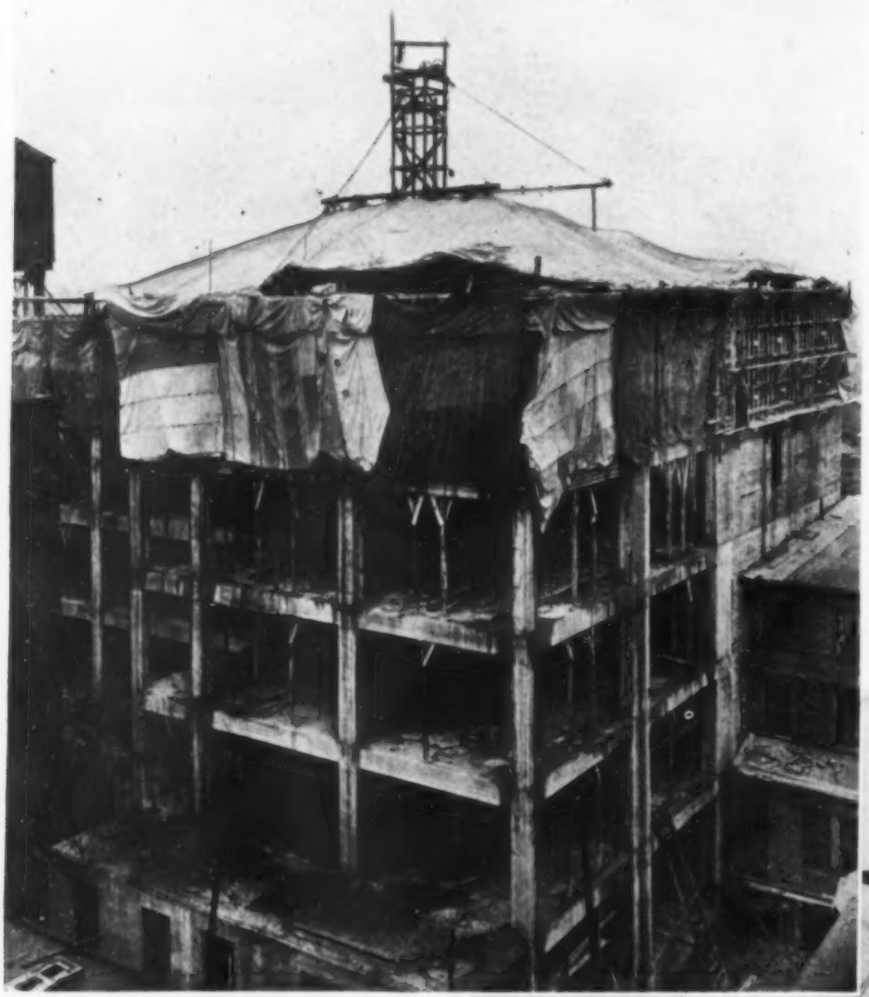
Sloping from a height of 15 ft. at the ridge pole to 3 ft. above the floor at the edge, where supports for the canvas were erected on the exterior columns, the roof

provided ample clearance for distribution of concrete by hand carts. The canvas had been treated with a colorless waterproofing which transmitted daylight and eliminated need of artificial illumination inside the tent. At two points under each section, the roof was supported by 2x4-in. poles placed against reinforcing patches on the canvas.

Heating System—The floor below was closed in with canvas tarpaulins. About 36 coke-burning salamanders on this floor maintained a high temperature inside the housing. With an outside temperature of 30 deg., for instance, the temperature under the floor was 100 deg. and under the tent was 70 deg. No special heat openings in the floor were required, as the heat could rise through a stair well and elevator shaft at each end of the building, as well as through the tower hatch in the center. In addition, a space about 1 ft. wide was maintained all around the building between the canvas inclosure and the forms. The Des Lauriers steel-plate panel forms used for the floors conducted the heat readily to the under side of the green concrete slab.

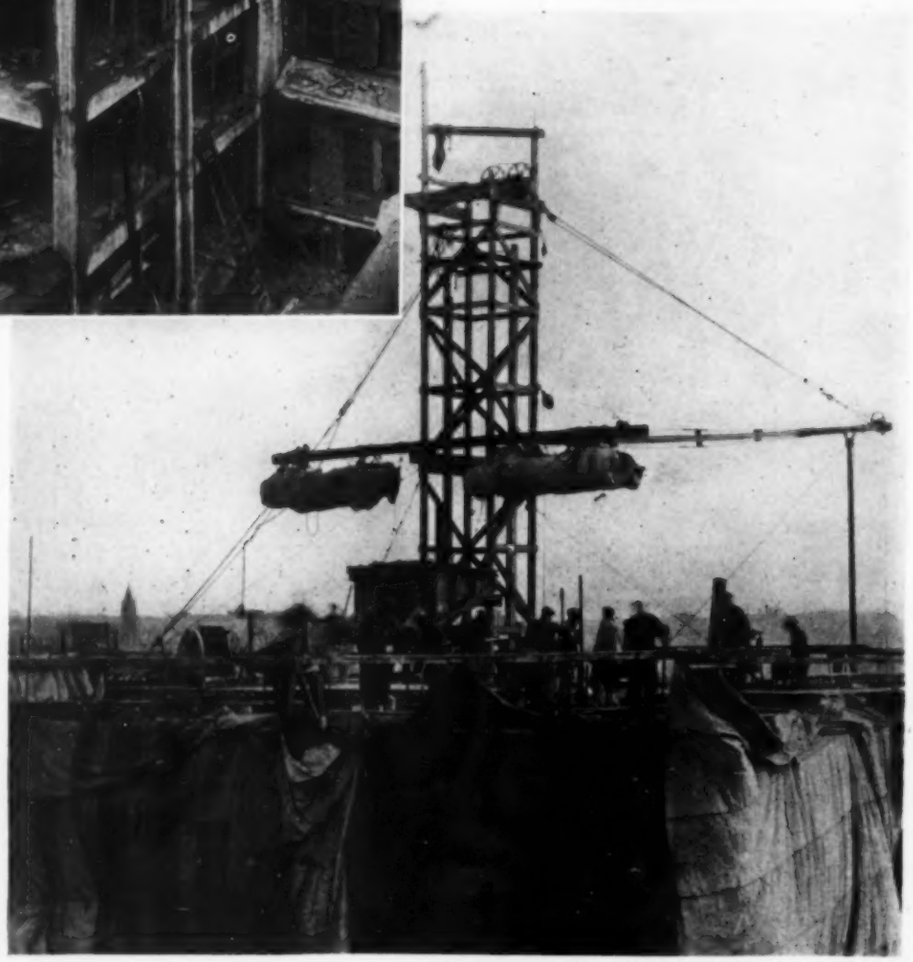
By using the canvas tent, the Willcox Construction Co. was able to pour the 8-in. finished monolithic floors of the building continuously and speedily, without interference by staging or other impediments. The tent was completely watertight, permitting concreting to proceed in the dry, even during hard rainstorms. No one was allowed on a floor until 24 hr. after the concrete had been placed.

The building was erected for Ex-Lax, Inc., under the direction of Binger & Ginsberg, consulting engineers, and Victor Mayper, professional engineer, all of New York City. Henry Willcox, vice-president, and Carl Youngdahl, superintendent, were in charge of operations for the Willcox Construction Co., Inc. C. R. Daniels, Inc., of New York City, designed and made the tent roof.



COMPLETE INCLOSURE for freshly placed concrete floor is furnished by tent roof above and canvas tarpaulins around sides of floor below. Salamanders on floor below supply heat.

FOUR SECTIONS OF CANVAS ROOF *(below)* are rolled and hoisted by means of horizontal arm on concrete tower. Timber arm also serves as ridge pole of tent.



When preparing to raise the tent from one floor to the next, workmen folded each section into a strip about 8 ft. in width, equal to the length of that part of the yardarm extending beyond the tower. Each strip was rolled around a 4x4-in. timber on the floor as close as possible to the yardarm. Furling was completed by means of two sets of block and tackle attached to the arm. In raising the loaded yardarm, weighing about 1,500 lb., to the next floor, the concrete bucket in the tower was employed as a counterweight, and three men hoisted the entire assembly by means of a two-sheave block and tackle at each end of the yardarm.

Actual raising was accomplished by the three men in 2 hr. It required 1½ hr. for eight men to furl the four sections of canvas, and 1 hr. to spread the canvas with the same number of men.

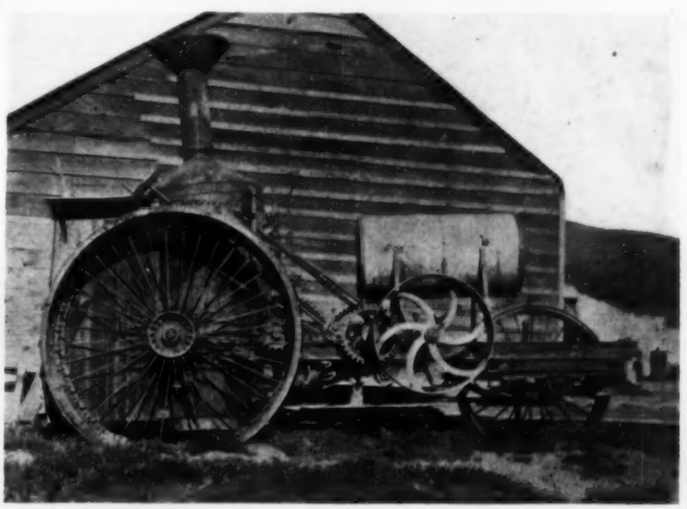
JOB ODDITIES

A Monthly Page of Unusual Features of Construction

TETRAHEDRONS *(above)* made up of railroad rail fastened with wire cable are installed by California Division of Highways along Colorado River to hold flood waters in channel and prevent flood damage to lands, highways and bridge structures. During periods of high water these pyramidal framework obstacles catch drift borne by river, diminish force of current and cause a gradual deposit of material at critical points.

MIDGET STRAIN DETECTOR. This "scratch extensometer," weighing less than 1 oz. and small enough to fit into the palm of the hand, has been developed by the Baldwin-Southwark Corp., of Philadelphia, for attachment to structures in order to measure and record tension, compression and shear stresses in their members. Amount of strain is indicated by scratch marks *(above, right)* made by genuine white diamond on target of specially heat-treated steel. Record is photographed, miscroscopically, and measured; with amount of magnification known, strain can be determined. Methods of attachment are availble by means of vacuum cups, so that extensometers can be used on flat plates where clamping is impractical.

A WASHOUT in the Hoover dam area, following a recent cloudburst, carried the earth fill from under one of the Six Companies' railway lines, leaving rails and ties hanging like suspension bridge.



AN OLD TIMER in the tractor family. Here's a Best "road steamer," built in 1885, which was brought to light near Arlington, Ore., during a recent demonstration of the new Caterpillar diesel tractor. The ancient machine was built by Daniel Best at Albany, Ore., 20 years before Holt brought out his first Caterpillar machine.

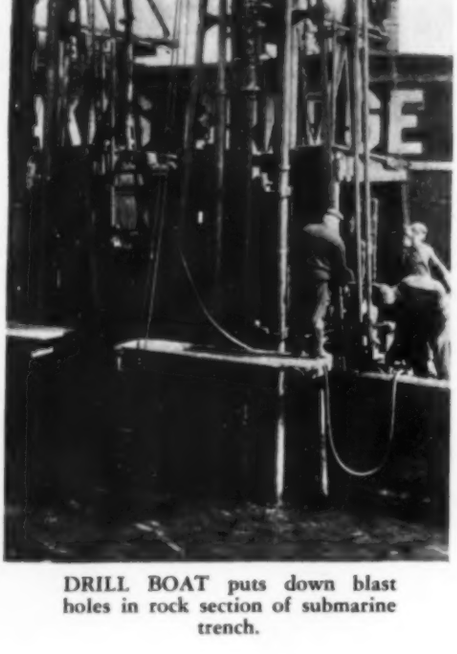
SUBMARINE CABLES

Are Laid in 76-Ft. of Water From Specially Equipped Barge

ACROSS the East River, New York City, in water of 76 ft. maximum depth, 14 three-conductor, 27-kv. electric cables were laid this summer by Allen N. Spooner & Sons, Inc., to connect the Hudson Ave. station of the Brooklyn Edison Co. and the downtown Manhattan system of the New York Edison and the United Electric Light & Power Companies. Seven of the cables are oil-filled, and the remainder are of the solid type. At the point of crossing construction was made difficult by troublesome tides and eddies and by dense river traffic which had to be avoided in carrying on the work.

Federal and local requirements made it necessary to lay the cables in a trench in the river bottom, 10 ft. wide and 3 ft. deep in rock and 10 ft. deep in mud and silt, the rock section being covered with concrete and the silt section backfilled.

Under a subcontract with the Great Lakes Dredge & Dock Co., the cable trench was drilled from an anchored barge, blasted and excavated by a dipper dredge. In rock, the drill holes were spaced 5 ft. apart and were charged with explosives lowered into them through long tubes.

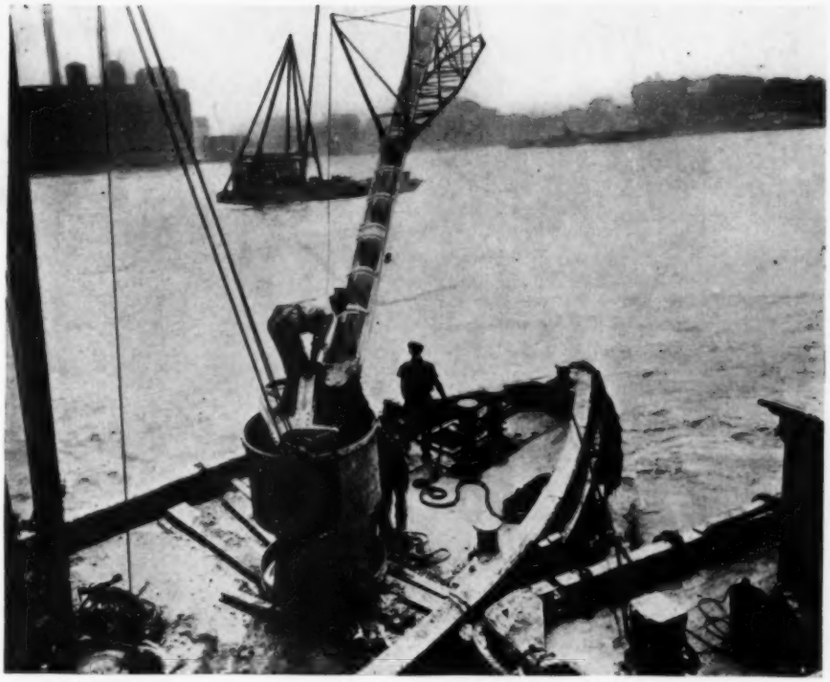


DRILL BOAT puts down blast holes in rock section of submarine trench.

Cables were delivered on reels in 2,330-ft. sections, long enough for a continuous reach between manholes on opposite shores of the river. Cable diameters (outside) are 4.36 in. for the solid and 3.69 in. for the oil-filled type. Three manufacturers supplied the cable, as follows: General Cable Corp., 3 oil-filled and 2 solid; General Electric Co., 4 oil filled and 1 solid; Okonite Callender Cable Co., 4 solid. All cables are armored by steel wire and covered with two layers of jute.

Laying of the cables, two at a time, was done from a barge, whose movement was controlled by a system of lines to anchorages on shore and in midstream, as illustrated in the accompanying sketch. On the barge the cable reels were mounted in cradles and the cables were payed out over a pair of parallel rollers on the stern of the barge, to prevent excessive bending of the lines as they descended to place in

GROOVED ROLLER DEVICE, hung on end of movable boom *(left)*, guides pair of cables in descent to trench bottom even when barge drifts slightly off line. Detail of rollers in frame, at right.



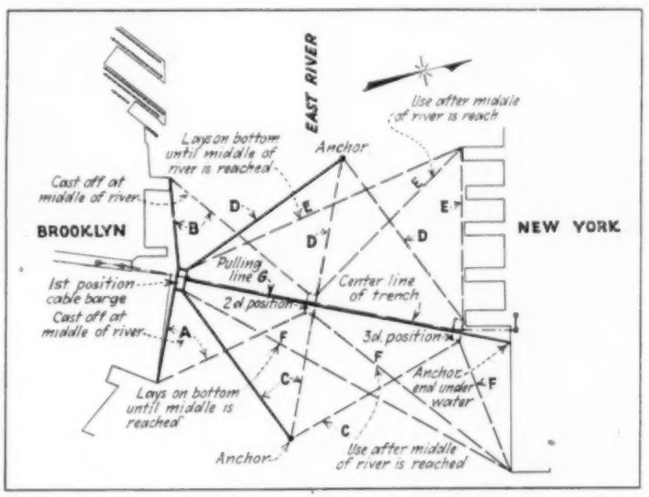
CONCRETE for covering cables in rock trench is mixed in barge plant and chuted into bucket which carries it to river bottom.

BUCKET, of 2-cu.yd. capacity, lowers concrete to trench in river bottom and discharges through bottom-dump clamshell-type gate.

the trench in the river bottom. Tugboats upstream and downstream from the cable-laying barge guarded the operations from interference by river traffic.

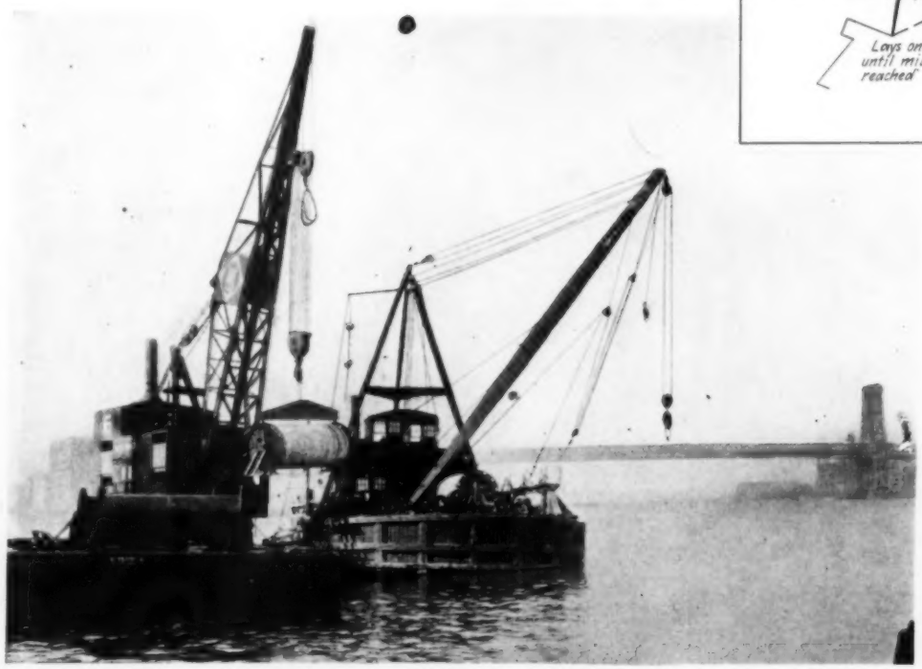
The cable-laying procedure (see sketch) was as follows: The Brooklyn anchorage lines, A and B, were slacked off, and lines C. D and G pulled in by winches on the barge. Lines E and F were left slack until the barge reached the middle of the river, when anchorages C and D served in place of A and B, which were removed, and lines E and F drawn up taut by the winches. By slacking off lines C and D and drawing up on lines E, F and G, the barge was moved to the Manhattan side.

BARGE CONTROL *(right)* **was handled by a system of anchorage and pulling lines which guided travel across East River.**



To deposit the cable accurately in the trench, even when the barge was slightly off line, an adjustable cable guide, consisting of parallel rollers, was lowered from a boom into the river and kept accurately on line.

The rock section of the trench, after the cable had been laid, was covered with concrete mixed on a barge and chuted into a special Blaw-Knox 2-yd. bucket which lowered it to place and discharged it through a bottom-opening clamshell gate.



REELS carrying the submarine cable were transferred to barge by derrick and mounted in cradles for unwinding.

Bridge Erected by Combination of

GIN POLES AND DERRICKS

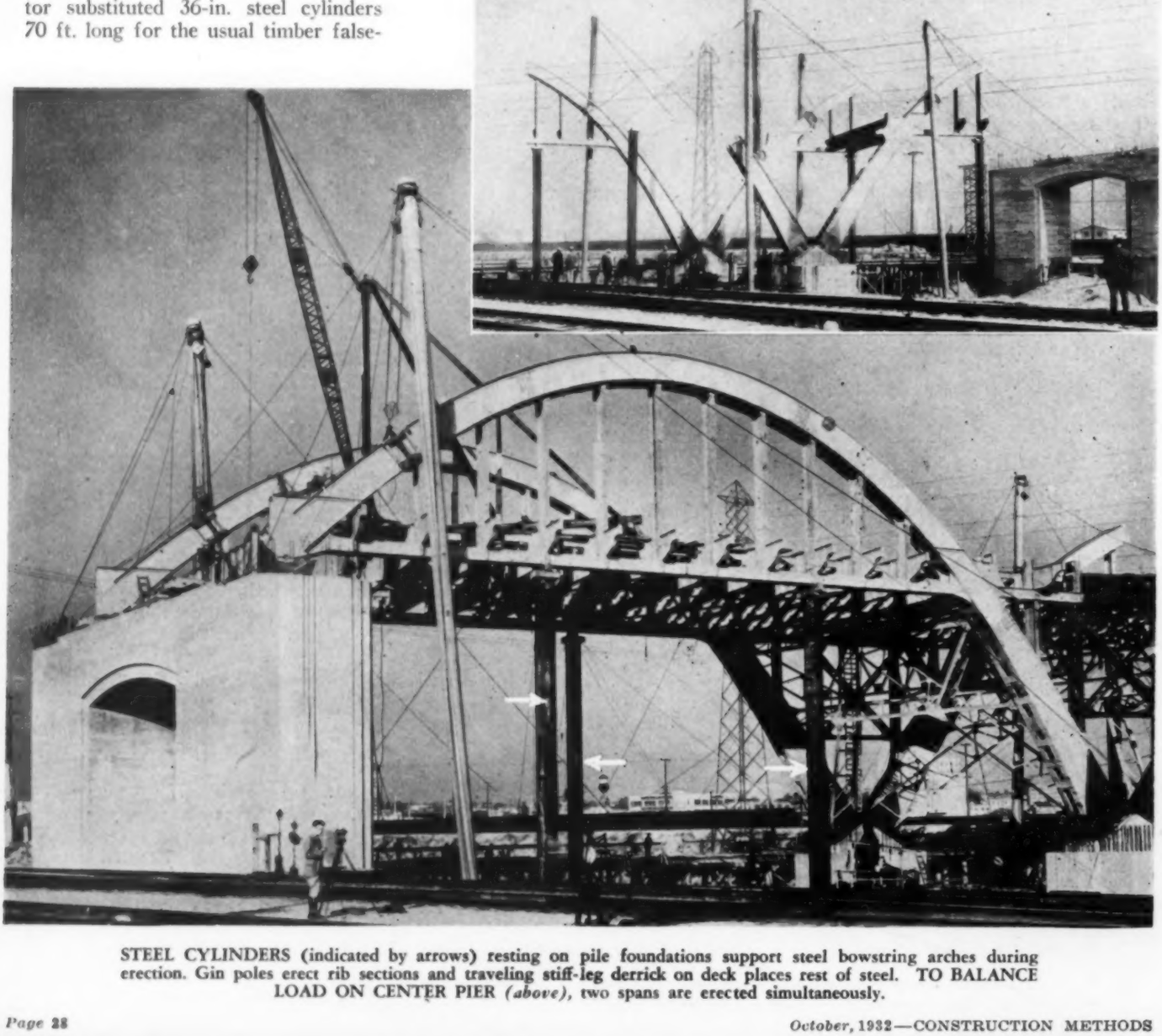
By HENRY E. ROBERTSON
Allen Bros., Inc.,
Los Angeles, Calif.

A COMBINATION of gin poles and derricks erected two 149-ft. unsymmetrical steel bowstring arch spans across the Los Angeles River, at Los Angeles, forming part of the Sixth Street viaduct described in *Construction Methods,* June 1932, pp. 37-39. Allen Bros., Inc., of Los Angeles, contractor for the steel erection, developed the unusual method of setting in place the 1,245 tons of steel in the two arches.

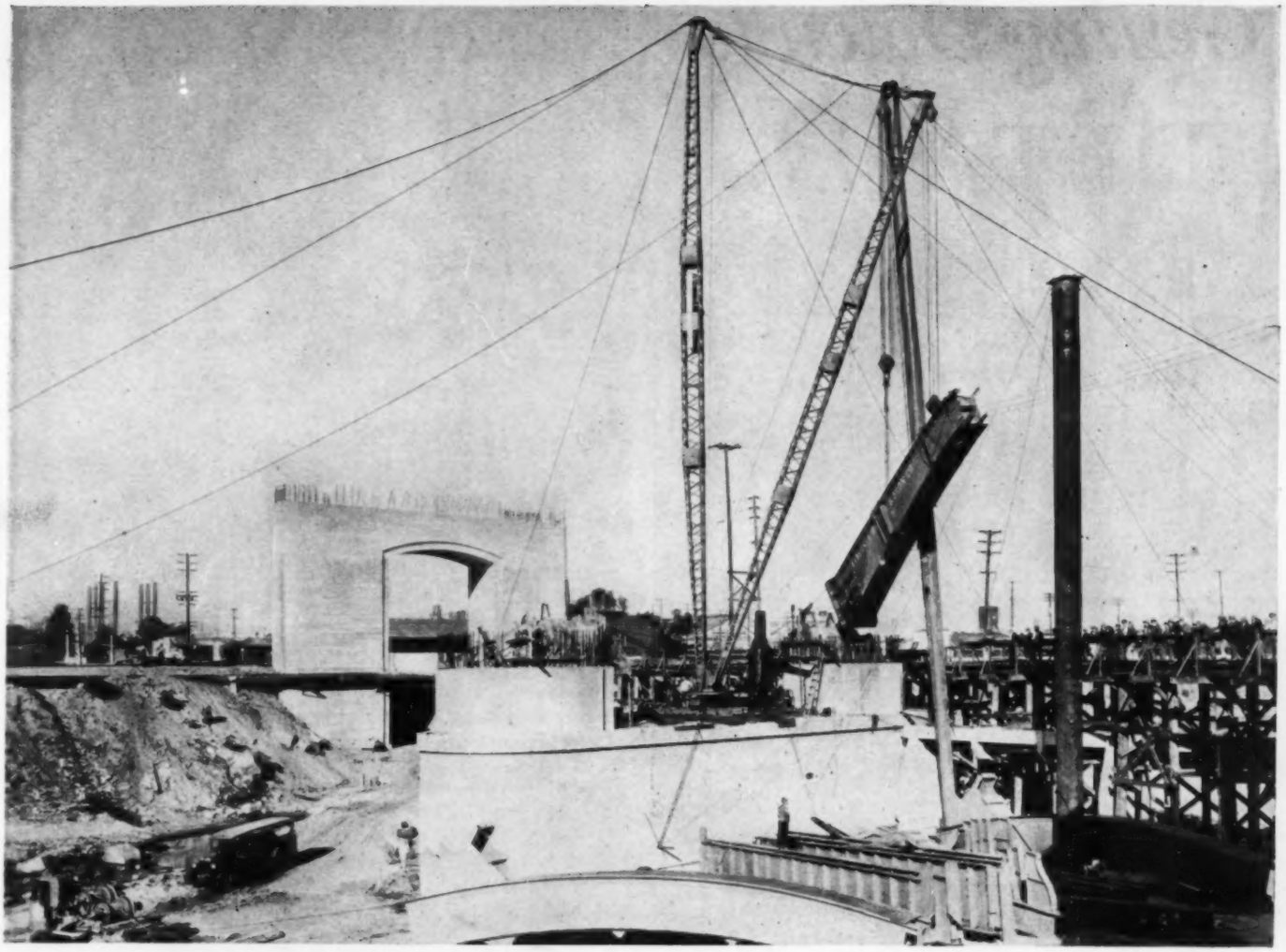
Because of the height of the arches above streambed, the weight of the rib sections, and the comparatively small gross tonnage involved, the contractor substituted 36-in. steel cylinders 70 ft. long for the usual timber falsework under the splices. The cylinders were installed on pile foundations and guyed off as erection proceeded.

Rib sections weighing about 40, 28, 19 and 25 tons, were delivered by heavy-duty trucks and trailers through the subway openings in the abutments, in some cases with a clearance of less than 2 in. Turned fir poles 32 in. in diameter and 120 ft. long, rigged as gin poles, and a 20-ton steel guy derrick raised the heavy haunch sections at the pier. The derrick then held the haunch sections in position while the gin poles handled the second rib sections. With these sections connected and supported, the derrick was free to erect the tie section and hangers. The completed portions of the trusses were seated on the steel cylinders.

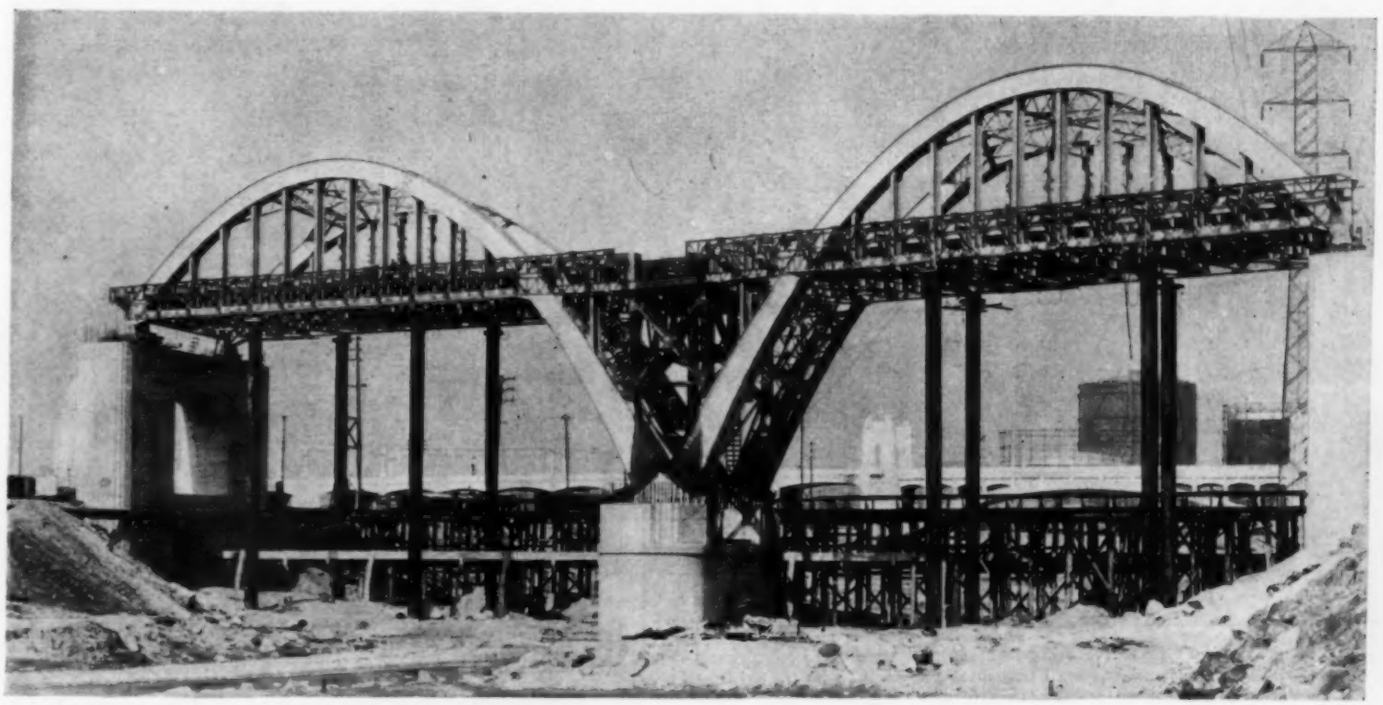
To prevent unbalanced loading of the pier, erection of both spans was carried on simultaneously. As soon as the floor system and bracing over the pier had been filled in, the guy derrick was removed and a 10-ton stiff-leg traveler was placed on the deck. The gin poles moved forward to set the rib sections, and the deck traveler erected the remainder of the steel.



STEEL CYLINDERS (indicated by arrows) resting on pile foundations support steel bowstring arches during erection. Gin poles erect rib sections and traveling stiff-leg derrick on deck places rest of steel. TO BALANCE LOAD ON CENTER PIER *(above)*, two spans are erected simultaneously.



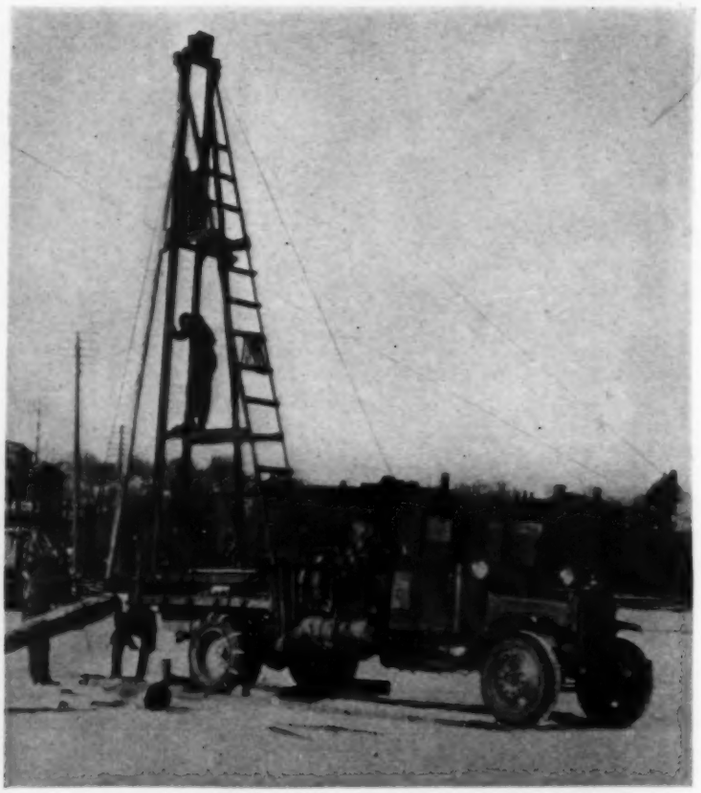
GUY DERRICK AND GIN POLE erect heavy haunch section at center pier. Derrick supports this section while gin pole places second rib section extending to steel cylinder at right.



UNSYMMETRICAL BOWSTRING ARCHES, each 149 ft. long, are erected by gin poles and derricks in 47 working days. Although both spans are on skew and bridge is on curve, connections are easily made.

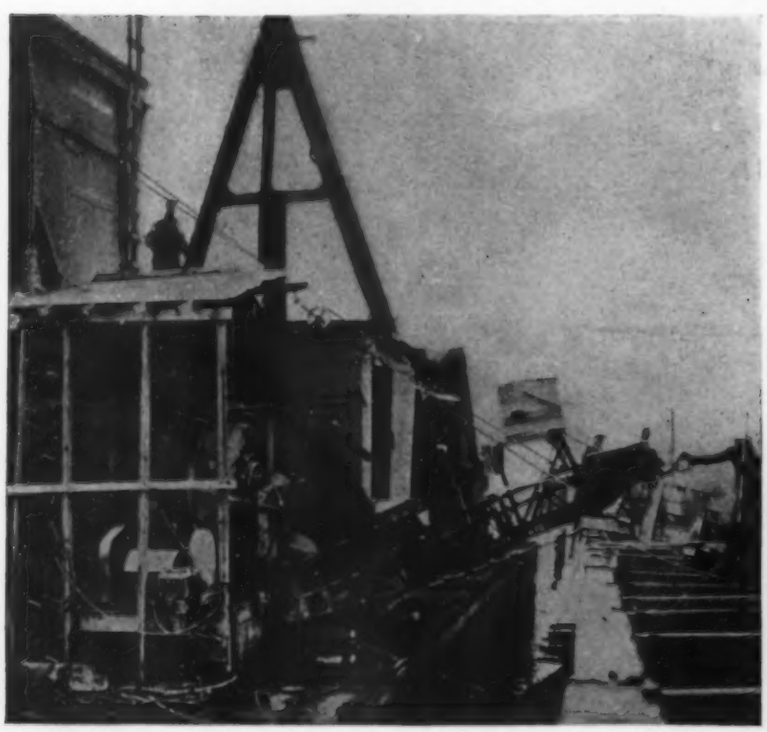
Getting Down to DETAILS

Close-up Shots of Job Methods and Equipment



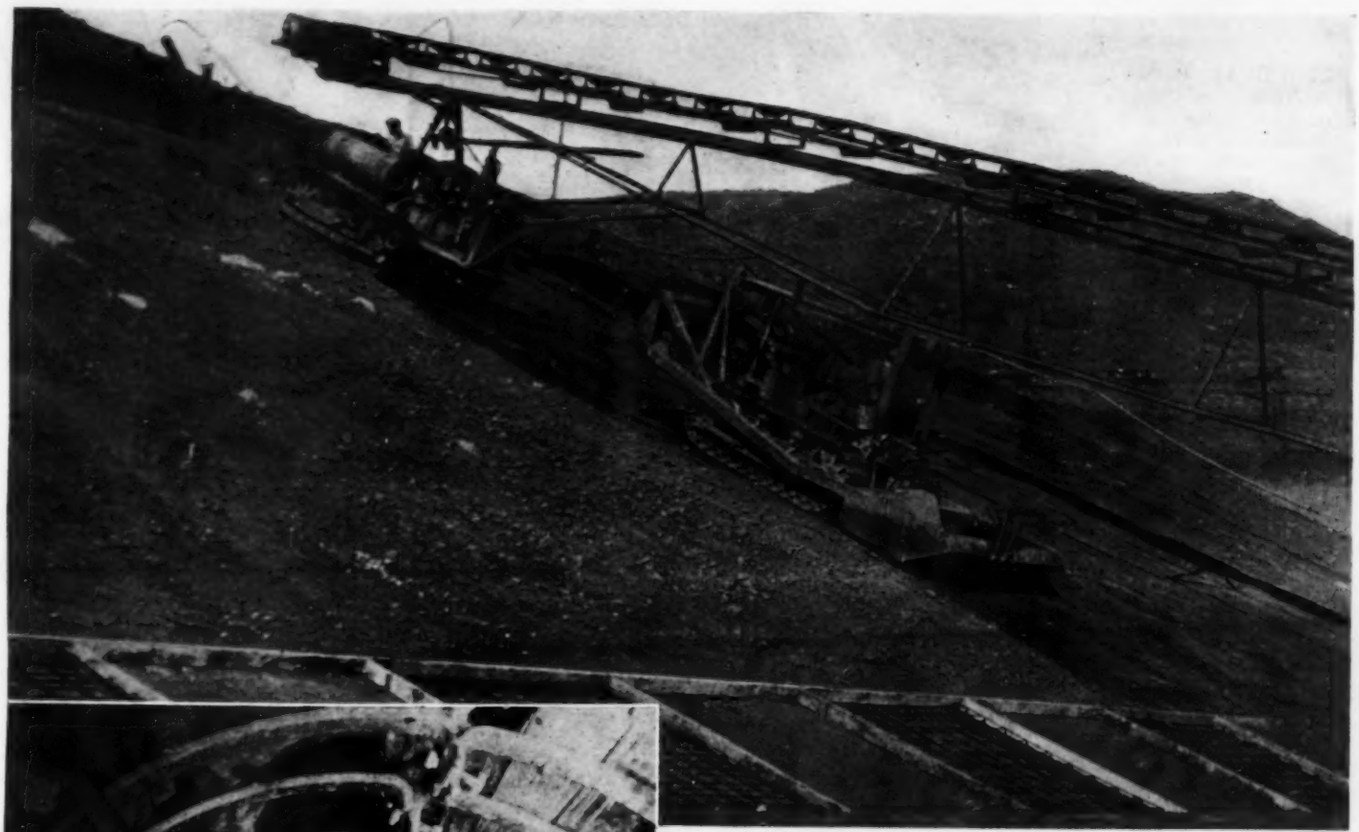
PORTABLE PILEDRIVER mounted on rear end of motor truck finds many uses in maintenance work of Minnesota Highway Department. Power is supplied by take-off from truck motor. Steel leads are demountable, for transport on trailer.

TEMPORARY PRECAST STRUTS resist arch thrust during erection of five-span reinforced-concrete bridge in Oklahoma. The struts, used in place of anchor piers, were carried down to rock.

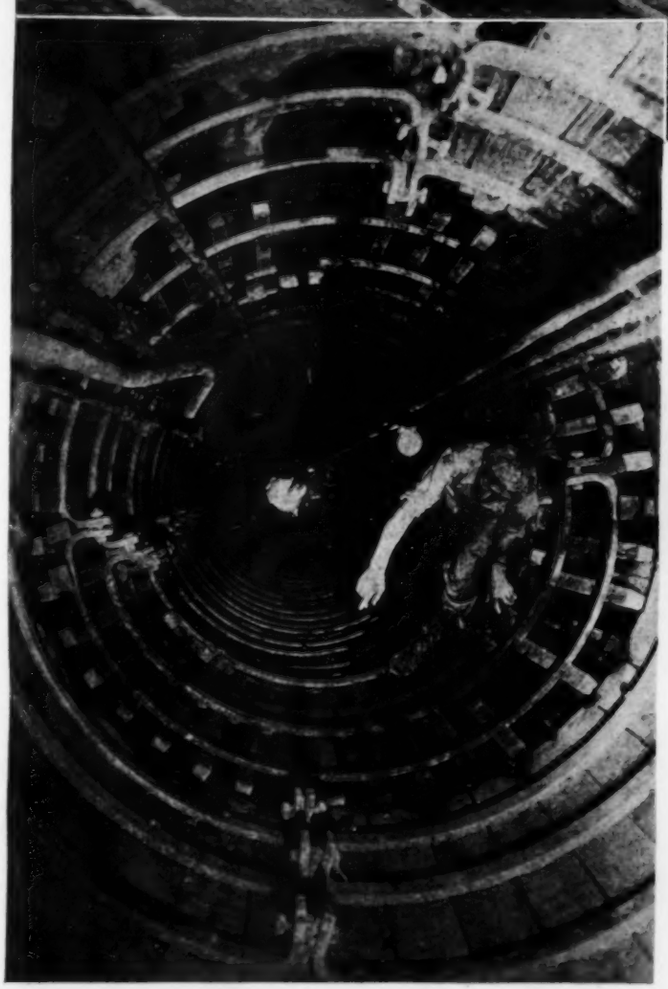


BELT CONVEYOR delivers concrete from barge-mounted mixer to forms for new retaining wall and dock at Maumee Bay, Toledo, Ohio. Barber-Greene electically driven unit, equipped with belt 18 in. wide on 18-ft. boom, works at angles of from 20 to 32 deg. Contractor, Newton-Baxter Co., of Toledo.

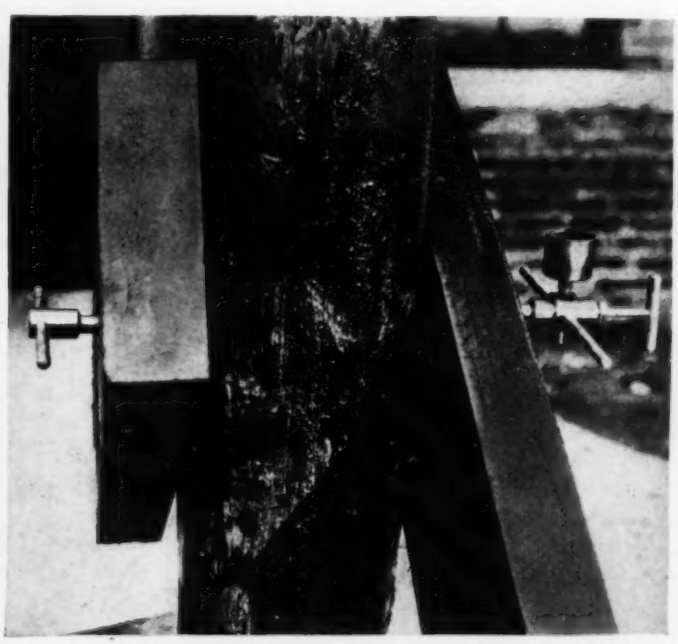
BOOM EXTENSION of 93 ft., on 70-ft. regular boom of Moore crawler crane, enables Chris Kanzler & Son, of Evanston, Ind., to set stone for 121-ft. high church steeple. Rigged with Hercules wire rope, the crane handled stone pieces weighing as much as 3½ tons.



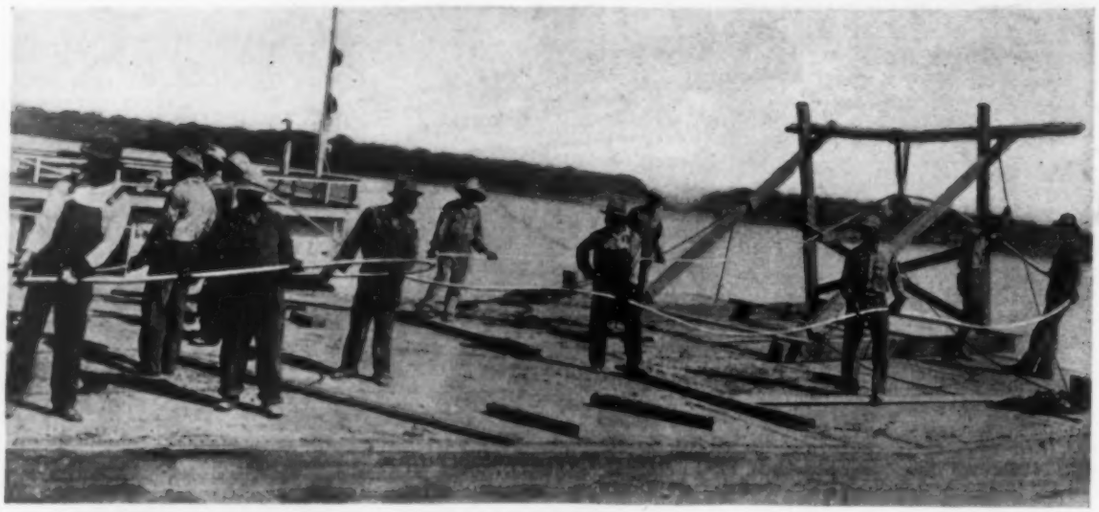
DAM SLOPES "SHAVED" accurately to grade by Le Tourneau "cowdozer" scraper pulled by Caterpillar "60" tractor prior to placing 6-in. reinforced concrete slab facing. Upstream slope of Santiago Creek dam in California is 1 on 2¼. A belt conveyor system was used by the contractor to transport earth fill from borrow pits to the dam, which is 130 ft. high and contains 1,100,000 cu.yd. of material.



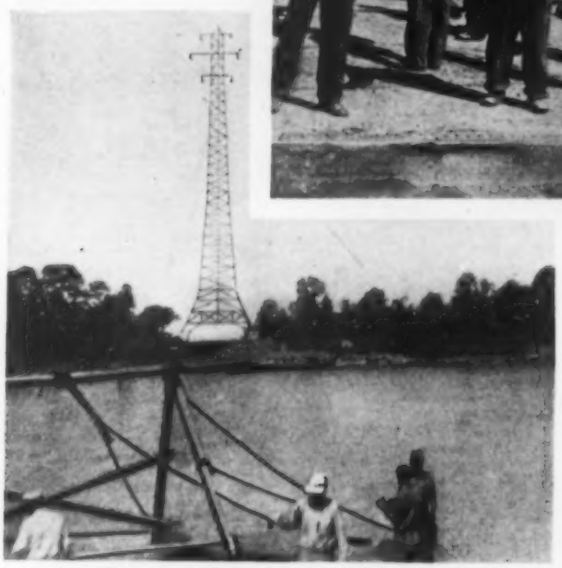
CONCRETE LAGGING, instead of wood, is used to line the caisson walls excavated to depths of 100 ft. for the foundation of the second unit of the 42-story Field building, to be Chicago's largest office structure. The lagging units, developed by S. G. Martin, civil engineer, have T-shaped cross-sections, with edges interlocked by tongues and grooves. Stems of T-sections project inward. Process saves excavation as diameter of well need not exceed diameter of pier formed by filling well with concrete, the T-shaped lagging being left in place. Foundation work was done by W. J. Newman Co., subcontractor for George A. Fuller Co., general contractor.



BOLT HOLES in timber structures may be treated with wood preservative by means of the Greenlee pressure device illustrated. Small hand pump is screwed into bored hole at one end and plug inserted in opposite end. Preservative is poured into cup, at right, and forced into wood, under high pressure, by pulling back on pump handle. Treatment prevents decay from entering heart of timber through untreated bolt holes.



ELECTRICAL CONDUCTOR CABLE *(right)* **unwound from bottom of reel as barge moves across river. Cable passes through snatch block hung on sling at rear end of barge.**



TOWERS 435 ft. high support 4,300-ft. river span of six conductors. Tower insulators are in place on crossarms.

PRE-CUT CABLES

Speed Stringing of 4,300-Ft. Transmission Line Span

ELECTRICAL cables cut to exact length in the factory aided the Phoenix Utility Co. in rapidly stringing six conductors of the longest transmission-line span crossing the Mississippi River, 10 mi. south of Memphis, for the Arkansas Power & Light Co. and the Memphis Power & Light Co. Expert technique on the part of the erecting force and freedom from interference by river traffic further expedited the erection of cables for the 4,300-ft. river span, culminating on the third day of this operation in the stringing of three conductors.

At each end of the river span is a tower 435 ft. high resting on four 12-ft. concrete caissons extending to a depth of more than 100 ft. below the surface of the ground. Anchor spans 1,800 ft. long behind the towers are dead-ended into steel A-frame posts 45 ft. above the ground. The A-frame posts are anchored to concrete blocks 120 ft. back of the posts.

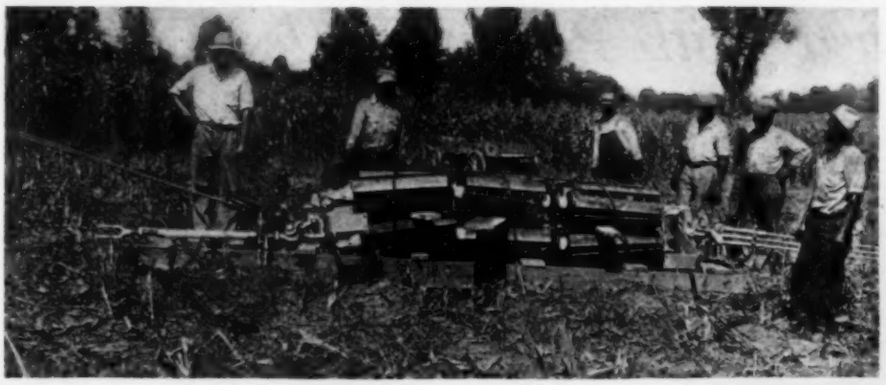
Steel-reinforced aluminum cable slightly less than 1 in. in diameter and weighing more than 1¼ lb. per linear foot was used for the conductors. As the conductors had been cut in advance to exact length for the main span and anchor spans, it was necessary to exercise great care in erecting the towers and A-frame posts to be sure that span lengths in the field would correspond with the design.

Each tower has three crossarms, and each arm supports two cables hung from it by triple-string suspension insulators. As the first step in stringing the conductors, the anchor cables were unreeled on the ground and attached at both ends to dampers, after which turnbuckles were installed. The anchor conductors then were attached to plates on the tower insulators and left hanging free.

Six reels containing cables for the river span were loaded at Memphis on a barge which moved downstream to the site of the river crossing and tied up near the Arkansas bank. The loose ends of the conductors were pulled ashore and attached to dampers and turnbuckles. They then were raised and fastened to the insulators on the Arkansas tower.

To string the main-span cables across the river, individual reels were placed upon a second barge which was towed to the Tennessee side by a tug, the cable unreeling and sinking to the river bottom as the barge moved ahead. The conductor reel was mounted on a spe-

CABLES from reels on stationary barge in foreground are attached to insulator assemblies on Arkansas tower. One reel has been mounted on barge in background preparatory to stringing across river.



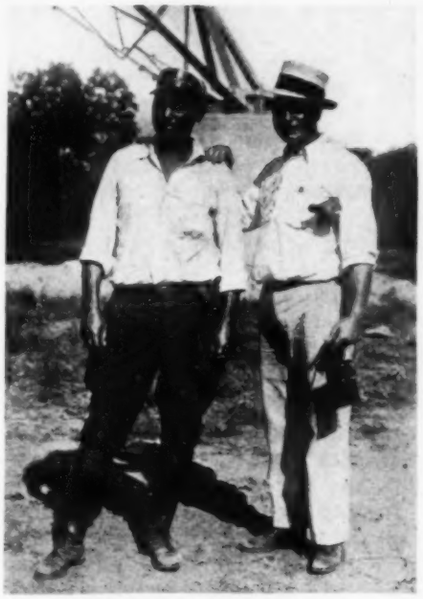
DEAD-END INSULATOR ASSEMBLY *(left)* **for one conductor consists of quadruple strings of eighteen strain insulators each. Crating is left on sides of strings to protect insulators during dead-ending operation.**

DAMPER *(right)* **is attached to end of conductor with aid of templet.**

cial timber jack about 60 ft. from the rear end of the barge. Speed of unreeling was controlled by means of timber brakes, each operated by two men, at both sides of the reel.

Depth of water varied from 10 ft. at the Arkansas side to 50 ft. near the Tennessee bank. To allow for displacement caused by the river current, the tug steered a course, marked by red flags on the Tennessee bank, 1 deg. 20 min. upstream from the center line of the river crossing.

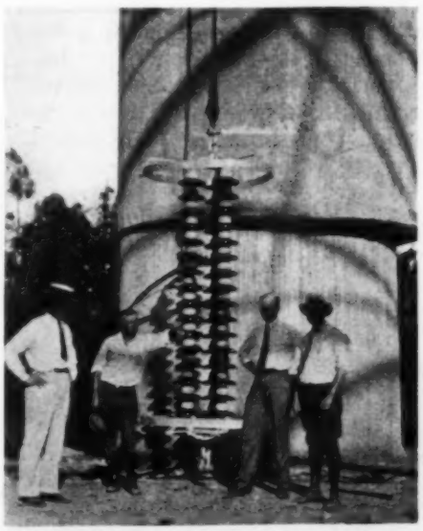
On the first day, the conductor for the upstream top arm was strung. The cable was long enough to permit the barge to tie up at the Tennessee bank. After installing the damper and turnbuckle, workmen connected a $\frac{3}{4}$-in. plow-steel cable by a clevis to the plate provided for pulling the conductor and reeved the cable through a block fastened to the plate at the lower end of the insulator assembly on the tower. The free end of the steel cable was attached to an Allis-Chalmers 75-hp. tractor which pulled the conductor out of the river and into approximate position for fastening to the tower insulator. In making the final short pull for attaching, the erectors used a Dorsey winch mounted on a Fordson tractor in conjunction with the 75-hp. machine.



A. B. KILGO *(left)* **and J. A. McCAMANT are in direct charge of work.**

After the main-span conductor had been attached at the tower insulators and the steel cable had been slacked off, the anchor-span conductors were dead-ended at the A-frame posts. Dorsey winches employed for this work on both sides were anchored to the concrete blocks in pulling up the shore-span conductors. Similar procedure was followed in stringing the other conductors.

Three days sufficed to string the six conductors, one being erected the first day, two the second and three the third. Two of the conductors were strung and dead-ended in less than two hours each. E. T. Brown, construction engineer, and A. B. Kilgo and J. A. McCamant, general foremen, directed operations.



TRIPLE-STRING INSULATOR ASSEMBLY ready to be raised to tower crossarm. At right of insulator is E. T. BROWN, construction engineer.

DEAD END FOR LAND CABLES is pulled up by a Dorsey winch mounted on the rear end of a Fordson tractor.

Tractors, Equipped With Power Blades, Build MOUNTAIN ROADS

IN WIDENING the road *(below)*, earth is removed from bank and bladed over side.

POWERED BLADE has little trouble in handling large-sized rock.

PUSHING material *(below)* from cut to fill is done best with straightened blade.

THE use of a backfiller-type blade on the front of a medium weight tractor has enabled Fay Elliott, contractor, Pasadena, Calif., to cut and build mountain roads at costs greatly under those of other methods. Elliott's equipment has been able to keep abreast of two ¾-yd. shovels doing similar work in the same material. The backfiller blade has been effective in making hillside cuts as deep as 20 ft. and in pushing material as far as 100 ft. for making fills. Roads 20 ft. wide have been cut economically. The equipment consists of a Cletrac "30" tractor on which is mounted a Wooldridge hydraulic trailbuilder blade. The blade and attachment are designed especially for mountain road building. The blade is power-controlled in its movement both up and down, and either end may be depressed.

In opening up a 5-mi. truck road to an asbestos deposit near San Fernando, Calif., Elliott cut and cleaned up one mile of 10-ft. road, averaging a 4-ft. bank on the hill side, in 12 days.

Various operators have evolved different methods of performing work with the tractor and blade. In beginning the construction of a mountain road, Elliott makes a comparatively short V-shaped cut with one end of the blade along the side of the hill. The start of the work is made from a fairly easy slope, the tractor resting on the slope, the hill end of the blade being depressed so as to make a horizontal cut. The operator gradually raises the blade as the tractor goes ahead, so that the V-cut shallows off. This makes a grade for the tractor to climb in going forward.

The tractor is then backed to the start of the work, and the blade is depressed at the original angle to cut off

HEAVY LOAD of material handled in cleaning up, with tractor working down grade.

ALONG SIDE HILL blade on front end of tractor piles up material to considerable height.

WIDENING OPERATION, with tractor working down hill.

BEGINNING A FILL. Material is shoved ahead in succeeding operations.

another slice. This second cut is deeper and wider, some earth being trimmed off the bank and bladed over the side. The tractor moves ahead up the grade of the first cut, the new cut coming to the surface beyond the head of the first work. Each succeeding cut, started a short distance in advance of the last cut, keeps the work moving forward at an incline. Pushing the head of the cut in this manner makes it possible to continue the work into almost vertical slopes without difficulty. This type of operation leaves a wave-like roadbed behind the tractor, which is leveled off to final grade in cleaning up.

Elliott has found that inexperienced operators are prone to cut too narrow a path, with the intention of widening the work after several hundred feet or so of roadway have been broken through. However, maneuvering the machine is much easier if the initial cut is broadened to several feet more than the width of the tractor. If it is desired to increase the width of the road after the proper grade has been obtained, the bank is undercut with the blade raised and the material is allowed to cave. By judicious use of the blade, the amount of caving can be held to a minimum to prevent burying the tractor. The loose dirt is bladed over the edge on the next trip.

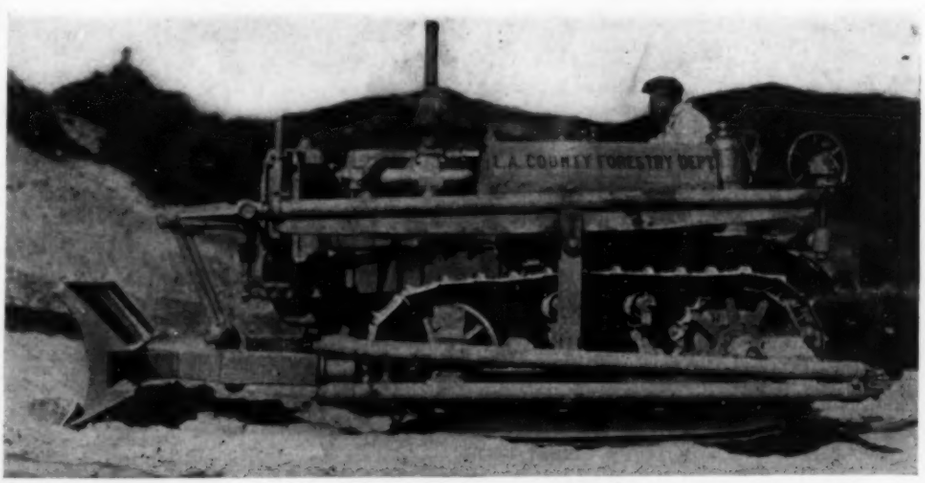
In carrying the road around a sharp reverse turn, such as encountered between the arms of a hill, difficulty is sometimes experienced in turning the tractor at the apex of the angle to make road in the new direction. When it is not practical to widen the road at the turn to provide backing space for the new direction, operations are carried on by cutting the road up to the apex, starting the road again on the other side of the turn, and then working back to meet the old head. The tractor leaves the constructed road at the apex of the turn and makes its way along the slope of the hill until a suitable place is found in which to dig in and start the road back to the turn.

The powered blade has proved valuable in cases where sliding of loose material at the edge of a road has started the tractor over the side. By depressing the blade and causing it to dig in and act as a brake, the operator is able to stop the fall. The front end of the tractor is then raised by depressing the blade to its full depth and the tractor is backed off on to the road.

Experience of crews in the national parks has shown that narrow, close-coupled tractors are best for mountain road-building work. Medium-weight tractors are preferred because of the awkwardness of the larger sizes and because the machines must be sufficiently small to give the operator a clear view of the blade and the material that is being worked.

It has been found economical to push material as far as 100 ft. for the purpose of making a fill. When a fill is to be made ahead, the angle of the blade is squared up and the material is pushed ahead instead of being rolled off the edge. It is usual to change the method of breaking out the road in approaching the fill. The tractor is not worked uphill in succeeding cuts, but begins to cut above the grade of the roadbed, and pushes each slice ahead to the fill.

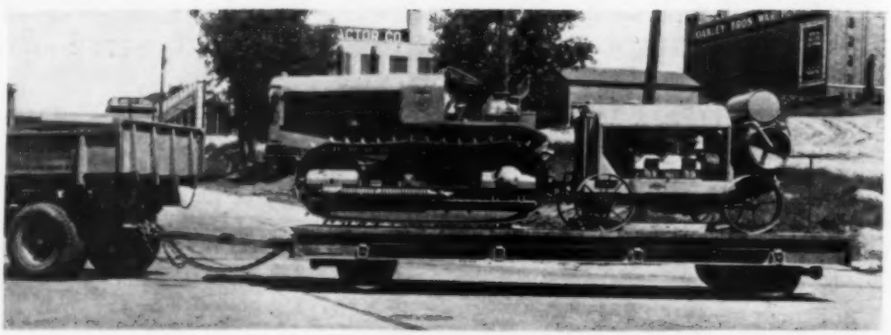
Elliott's experience has been that he can use a tractor effectively in any material in which a small shovel may be used. Rock and other hard deposits must be dynamited before being worked, just as is the case with shovel work. The tractor blade is sufficiently rugged to handle large sizes of rock without difficulty. Because only small amounts of material are handled at a time, the tractor is rarely under unusual strain and the rate of depreciation is low. Allowing for interest, overhead and profit, as well as for depreciation, Elliott has been able to rent his equipment on a time basis at $4.50 an hour.



DETAILS of design and mounting of power-operated blade on tractor of Los Angeles County Forest Department.

New Equipment *on the Job*

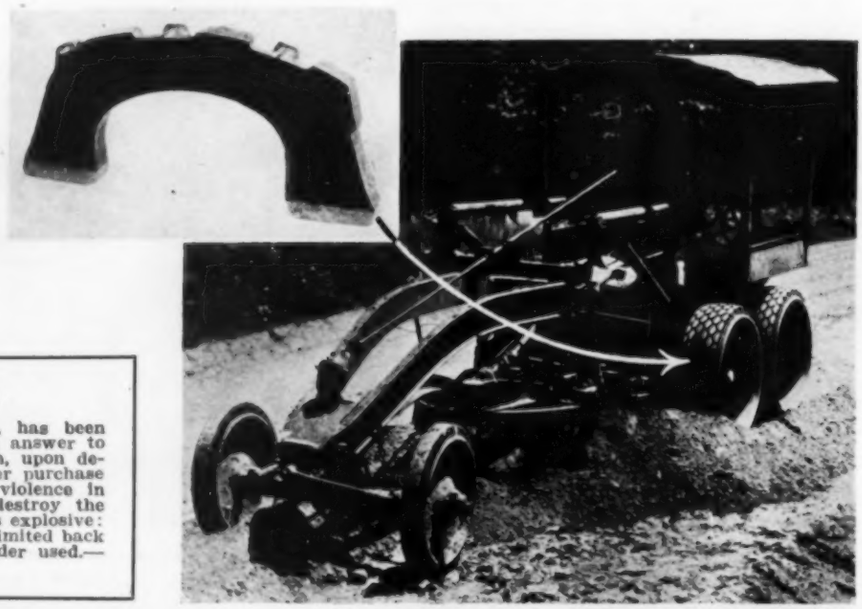
CONVERTIBLE SHOVEL, ¾-yd. capacity, light enough to mount and transport on heavy-duty motor truck. Weight 6½ tons. Three operating shaft assemblies on fully enclosed machinery deck control operations of traveling, steering, independent crowding and hoisting. Three travel speeds and two operating speeds. Powered by 4-cylinder, slow-speed, industrial-type motor, developing 30 hp. Uses 10 gal. of gasoline per day in steady digging. Bear Cat, Jr., manufactured by The Byers Machine Co., Ravenna, Ohio.



PNEUMATIC-TIRED TRAILER, in capacities up to 35 tons, is fully reversible and travels in either direction eliminating turning at end of haul. Steering controlled from either end on all wheels. Double-end brake control. Flat platform permits loading from either end or at sides with assistance of skid ledges furnished with trailer. Oscillating axles enable wheels to conform to road conditions and also distribute load evenly.—C. R. Jahn Co., 1140 First National Bank Bldg., Chicago, Ill.

DOUBLE-SPUR GEAR DRIVE ROLLER in 6-, 7- and 8-ton sizes, for work on subgrades, stone and gravel courses and on all types of top surfacing. Full roller weight may be shifted on front roller to concentrate pressure on high spots. Equipped with automotive type differential which equalizes power on rear rollers whether operating on sharp curve or straight-away. Other features: low center of gravity; short wheel base; scientific balance to minimize pitching and side sway; easy shifting gears, and one-clutch lever controls. Can be equipped with pneumatic scarifier, water cooled air compressor, planing blade and sprinkler attachments for rolling hot asphalt. Austin-Western Road Machinery Co., 400 N. Michigan Ave., Chicago, Ill.

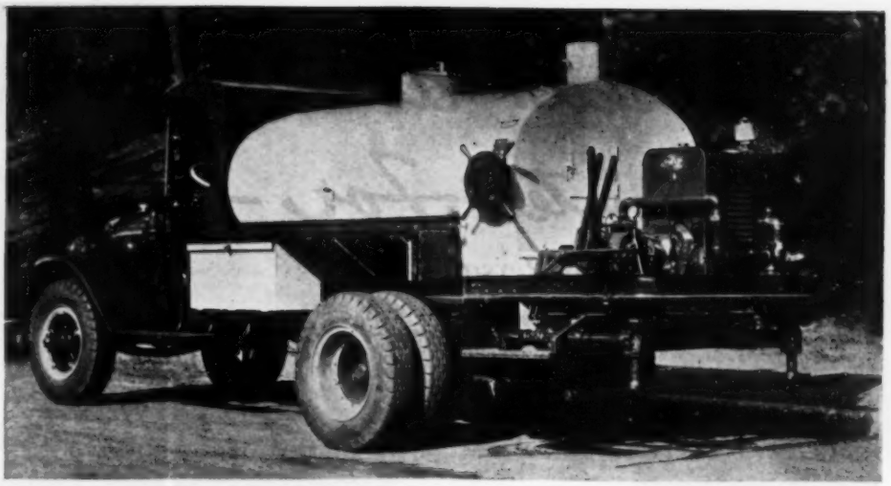
HIGH-TRACTION TIRE *(below)*, known as "Zero Pressure," for use with solid tire tractor wheels. Consists of flexible rubber arch *(insert)* of sufficient size and rigidity to provide ample carrying capacity, built on a slotted steel base. Having no air pressure, tire assumes concave tread profile under load which in sand or soft soil packs material under center and produces a track for tire to ride on instead of causing it to dig itself in. Eliminates bouncing, requires no inflation and increases efficiency of equipment. Also provides opportunity to reduce weight of tractor wheels as much as 50 per cent.—B. F. Goodrich Co., Akron, Ohio.



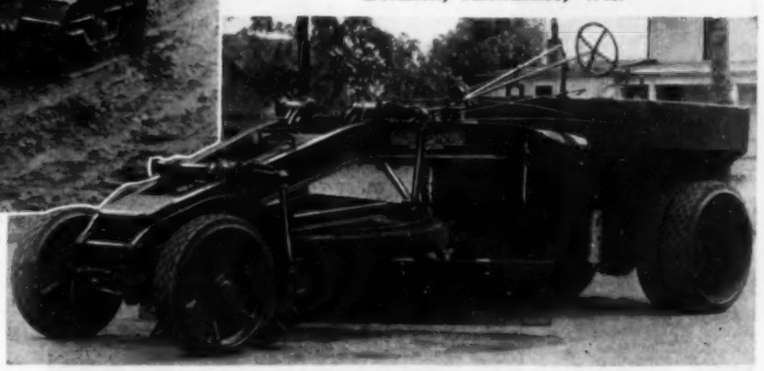
A More Effective Blasting Agent

APEX, a high explosive of low density type, has been developed for quarry and coal mine blasting in answer to a need for an explosive of dynamite type which, upon detonation, creates force capable of gaining greater purchase on the burden. It generates a force of low violence in shattering action, but of sufficient power to destroy the crystalline nature of rock. Results of use of this explosive: Ideal fragmentation, controlled throw of debris; limited back break and more tons of rock per pound of powder used.—Atlas Powder Co., Wilmington, Del.

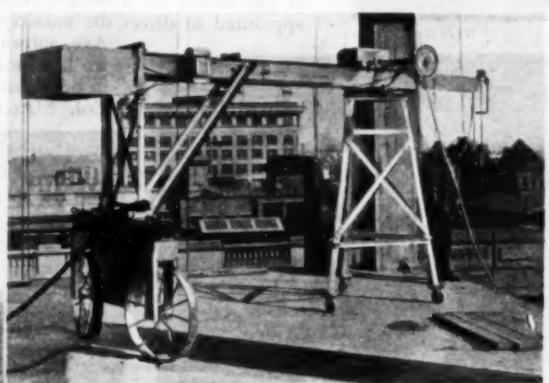
PRESSURE DISTRIBUTOR *(right)*, of 500- to 1,500-gal. capacity and for mounting on any suitable truck, trailer or semi-trailer, handles tar, asphalt, road oil, cutback or emulsions. Six-way valve controlled from a hand wheel handles filling, circulating, spraying and drawing operations. Equipped with pump that supplies maximum spray bar width of 20 ft. Low pressure burner and continuous heat flue enable distributor to raise temperature of heavy penetration types of bitumen 5 deg. F. per minute. Motor at rear eliminates long pipes, and assures uniform pressure and accurate control.—Littleford Bros., 443 East Pearl St., Cincinnati, Ohio.



TRACK WAGONS *(left)* equipped with 15-ton drop-forged tracks. Line includes bottom-dump, end-dump, pipe and industrial types. Bottom-dump wagons of 5½- to 8-cu.yd. capacity. Castings of alloy steel. Bottoms or doors of extra heavy, medium carbon steel plate. Bodies balanced on tracks by 4-in. diameter, heat-treated alloy steel main axle and two 3½-in. diameter stub axles. Frames and drawbar of heavy construction. — Allis-Chalmers Tractor Division, Milwaukee, Wis.



PORTABLE UTILITY CRANE *(below, right)* for use in industrial and building operations. Counterweight end swings radially to move boom when extended through a 14-ft. arc. Boom head racked in and out covering reach of about 8 ft. from face of building. Automatic brakes. Capacity 1,000 and 2,000 lb. with 25 per cent overload guaranteed for occasional lifting. Speed, 30 to 40 ft. per minute. Lift, 40 to 125 ft. Dismantled in three light-weight parts for convenient handling.—Robbins & Myers Sales, Inc., Springfield, Ohio.

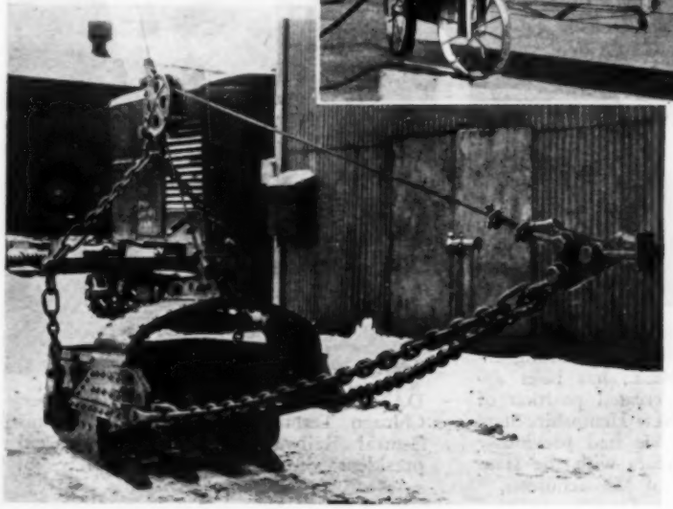


ONE-MAN MOTOR GRADER with hydraulic control feature which enables operator to make all adjustments of moldboard and scarifier with three levers. Main frame of 10-in. channel steel, pipe-reinforced and welded throughout; moldboard assembly designed to eliminate chattering; ball-and-socket joints. McCormick-Deering, Cletrac or Case power units. Wheel or crawler equipped. Open, covered or fully inclosed cab.—Galion Iron Works & Mfg. Co., Galion, Ohio.

If You Want Further Information—

Within the space limits of these pages it is impossible to present complete information about the products illustrated.

The manufacturers, however, will be glad to supply further details if you will write to them, referring to this issue of *Construction Methods*.



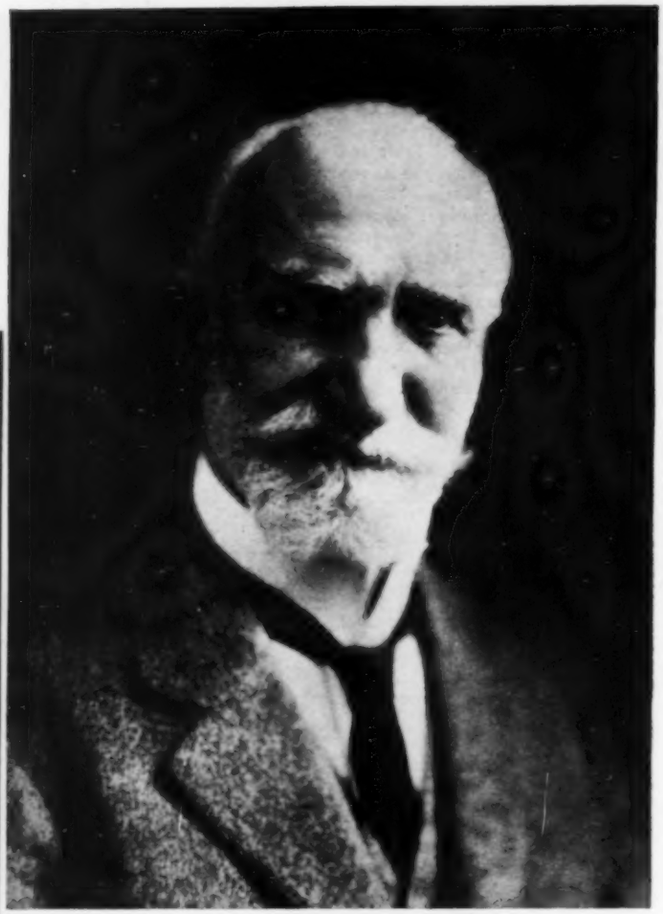
DRAGLINE BUCKET *(left)*, of from ¾- to 4-cu.yd. capacity, of combination riveted and welded construction giving ample strength with minimum weight. Bucket shell of heavy tank steel. Bottom and sides cut from single piece with back welded into position. Cutting lip of forged boiler plate is renewable. Bucket teeth are special manganese steel castings riveted through lip and bottom of shell. Teeth points renewable and reversible.—Harnischfeger Corp., Milwaukee, Wis.

Present and Accounted For —

A Page of Personalities

Wide World Photo

COL. JOHN R. SLATTERY *(left)*, deputy chief engineer of the Board of Transportation, of New York City, was appointed to direct the municipal operation of the new 8th Ave. subway, which was placed in service last month. As a result of overwork in organizing the new subway operation Col. Slattery died suddenly Sept. 23.



CHARLES D. MARX, professor emeritus of civil engineering at Leland Stanford University, California, is chairman of the board of engineers appointed by President Hoover to pass upon the engineering adequacy of projects for which applications for loans are made to the Reconstruction Finance Corporation, as provided for by the Emergency Relief and Construction Act.

Moffett-Russell Photo

GERHARDT F. MEYNE, head of the contracting company that bears his name, has been named chairman of the new Construction Industries Council of the Chicago Association of Commerce, formed to consolidate the interests of engineers, architects, builders, general contractors nad equipment and material manufacturers.

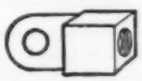
DANIEL H. DICKINSON, member of the firm of Morse & Dickinson, consulting engineers, of Boston, Mass., has been appointed to the newly created position of chief engineer of the New Hampshire State Highway Department. He had previously served for about 25 years with the state highway department of Massachusetts.

DANIEL J. BRUMLEY, chief engineer, Chicago Terminal Improvements, Illinois Central Railway, is the newly elected president of the Western Society of Engineers.

MARION Contractors Specialties

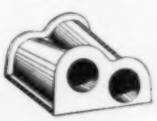
Hex Coupling
For making reinforcing continuous, for use as an insert, for form ties.

Form Spreader
Used with Hex Coupling.



Form Tightener
An efficient tightener for wire form ties. See sketch at right.

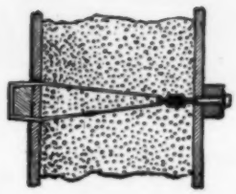
Cable Clips
Persistent grip, steel U-bolts with cold rolled threads.



Tank Lugs
Of strong, tough, shock-resisting Marion Certified Malleable Iron.

Washers
Shock-proof malleable castings for bolts, tie-rods, braces

(106)



a better way to wire formwork

Thread the wire tie through eyelet in Marion Wire Form Tightener. A bolt, passed through the form, screws into threaded hole in the tightener. Accurate adjustment easily accomplished.

When form is wrecked, bolts are removed for re-use. Hole in concrete neatly plugged with concrete. No wires to snip, no discoloration of finished work.

When both faces of wall are to be finished, a tightener is used on each end of the wire tie.

25¢

You NEED This Book

A stiff-bound, 112-page book of detailed information on concrete formwork—35 pages of detail drawings—60 pages of useful tables—17 pages of miscellaneous data—mailed for the nominal cost of 25c. Get your copy at once.

Marion Malleable Iron Works
923 Miller Ave. • Marion, Ind.

DIETZ LANTERNS
Red Light that warns of *Danger*

DIETZ TORCHES
White Light that *Marks the Way* . . .

Dietz Red Lanterns and Dietz Torches equip Contractors with unexcelled DANGER and CAUTION Lights for night warning service on highway and construction work.

. . . Dietz RED Lanterns—Red Danger Lights of highest illuminating power. They stay lighted in all kinds of weather.

. . . Dietz Torches—fitted with Dietz All-Weather Burner. Highest reliability in Open Flame Caution Lights.

For Dietz protective lighting you pay a low price for safety. Order from your Supply Dealer.

• ■ •

R. E. DIETZ COMPANY
NEW YORK
Makers of Lanterns for the World
FOUNDED 1840

DIETZ LANTERNS

WALLA WALLA'S "CATERPILLAR" DIESEL CIVILIZES MILL CREEK

FINDING a choked channel as its spring freshets roared into town—Walla Walla, Washington's historic Mill Creek would go on a wild spree of flooding stores, streets and cellars.

The City Commission wanted to clear the channel and build a catch basin to prevent future floods—at the lowest possible cost. After a careful check-up, and a convincing demonstration, the Commission purchased a "Caterpillar" Diesel Tractor and a Hyster Scraper.

Now Walla Walla's Diesel is proving its tremendous power and traction—crowding the big scraper full of "cement" gravel and boulders—making a sure way up the steep banks with full loads. Mill Creek's expensive habits are being broken.

And the Commissioner of Finance writes that the "Caterpillar" Diesel is doing the job for less than one-tenth the cost per yard paid for a former method!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.
Track-type Tractors Road Machinery
Combines
(There's a "Caterpillar" Dealer Near You)

Prices — f. o. b. Peoria, Illinois

FIFTEEN	$1100	THIRTY-FIVE	$2400
TWENTY	$1450	FIFTY	$3675
TWENTY-FIVE	$1900	SIXTY-FIVE	$4350
DIESEL	$6500		

CATERPILLAR
REG. U. S. PAT. OFF.
TRACTOR

Contractors!

Do You Know That DU PONT VENTUBE Saves You Real Money In Tunnel Construction?

because

. . . It gives you a flexible, easily handled, efficient ventilating system that assures you of no lost time at the face.

. . . It is easily transported from place to place and quickly installed.

. . . It quickly clears fumes and dust from the working face.

. . . It is strong, rugged, and highly resistant to abrasive action.

. . . It delivers good air to your men at all times under every condition, thus increasing their efficiency and production.

. . . It will deliver as much air as any tubing. Has a patent coupling that prevents loss of air at joints.

. . . It is economical—low in installation and maintenance costs. Can be used again and again.

Leading contractors are now using du Pont Ventube exclusively on large tunnel jobs throughout the country.

DU PONT
VENTUBE
REG. U.S. PAT. OFF.

E. I. DU PONT DE NEMOURS & CO., INC.
NEWBURGH, NEW YORK

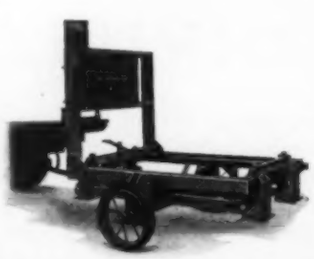
A Fairbanks Wheelbarrow Scale "on the Job"

"Calling for manual labor wherever possible"

Reconstruction Finance Corp.

THE federal government wants men at work—hence the above specification in Federal Aid agreements for road building and construction projects.

Fairbanks Skip Mixer Scale. Notice the three ingredient beams



Fairbanks Skip Mixer Scale mounted on special dolly for towing

But the Fairbanks Wheelbarrow and Skip Mixer Scales fit perfectly into such operations. Trundle a wheelbarrow of aggregate on the scale or dump it into the skip—the "over and under" indicator instantly tells whether the load is "light" or "heavy." And the same scale will allow pre-set weighing of as many as three different ingredients.

Weigh with these scales and you know the job will meet contract specifications. Fairbanks, Morse & Co., 900 S. Wabash Avenue, Chicago. And 40 principal cities—a service station at each house.

Fairbanks Scales

Preferred the World Over

NO WONDER
TRU-LAY PREFORMED WIRE ROPE OUTWEARS AND OUTPERFORMS

● TRU-LAY Preformed Wire Rope *should* last longer — because in TRU-LAY, the worst enemy to rope life, namely, internal stress, is eliminated. Instead of twisting, cranky rope consisting of wires and strands held forcibly in place, in TRU-LAY you have a wire rope in which wires and strands lie normally and naturally in position, without internal stress.

Each strand carries its equal share of the load and does its equal share of the work . . . because wires and strands are preformed to their exact helical shape.

● TRU-LAY resists twisting on the drum or sheave, cutting down this grinding action which is so damaging to crown wires. TRU-LAY strands, because they are equally loaded, resist high and low stranding, overcoming another fault which quickly destroys wire rope.

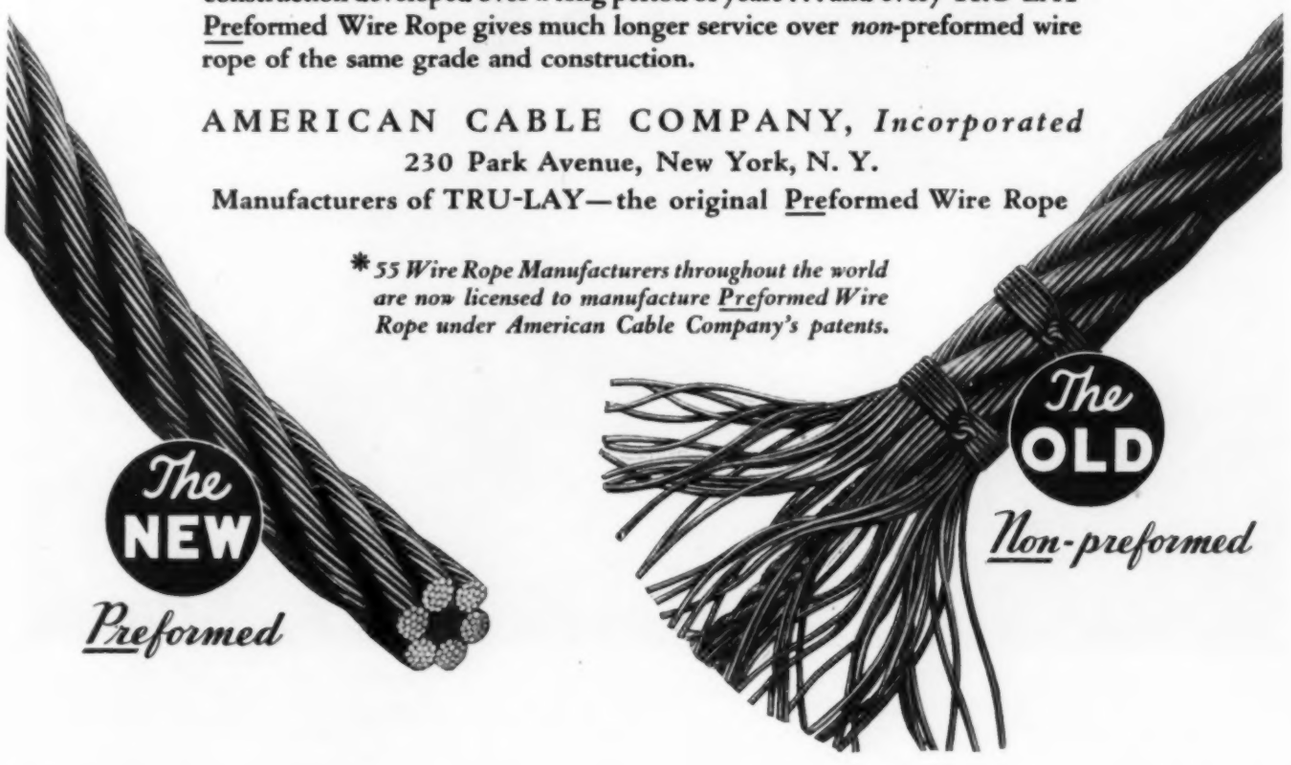
TRU-LAY resists kinking and is easy to handle. Wires that break after long wear lie flat in position—won't damage other wires. This also makes handling of the rope by hand much safer, avoiding slashing and probable blood poisoning.

No wonder wire rope users the world over* demand TRU-LAY Preformed Wire Rope . . . the rope that really returns dollar value in service and performance.

You can buy TRU-LAY Preformed Wire Rope in every grade, type and construction developed over a long period of years . . . and every TRU-LAY Preformed Wire Rope gives much longer service over *non*-preformed wire rope of the same grade and construction.

AMERICAN CABLE COMPANY, *Incorporated*
230 Park Avenue, New York, N. Y.
Manufacturers of TRU-LAY—the original Preformed Wire Rope

* *55 Wire Rope Manufacturers throughout the world are now licensed to manufacture Preformed Wire Rope under American Cable Company's patents.*



Now let's get our feet

off the ice . . . *and sell*

"The job is to get into motion before another thirty days have passed . . . . . ."

from Report of A. W. Robertson, Chairman
Committee on Industrial Rehabilitation

A call for action . . . action by those who still know how to sell

THIS Committee on Industrial Rehabilitation is getting busy without delay. It means to act, and act promptly. Sub-committees are now being formed in every Federal Reserve District. Perhaps they have already called on you.

They're going to create buyers and thereby create opportunities for sellers. They're going to call on plant after plant in every industry. They're going to sell the idea to industrial managements that modern equipment installed now will improve any company's price position, thus enabling it to compete for business as consumer demand picks up. They are going to show that it is to industry's own self interest to modernize now because equipment can be purchased and installed today for far less than its future cost will be.

It is conservatively estimated that every dollar spent or pledged on this "capital goods" replacement program, will put several other dollars to work paying wages and purchasing materials throughout other industries indirectly affected by the production and movement of basic "capital goods." Here is a sort of business revival snowball, which, if it can be started rolling now is absolutely certain to gather weight and momentum as it goes.

Here is the time and place for action by those who haven't forgotten how to sell. The Committee on Industrial Rehabilitation can't do all the work. It can create interest, arouse desires, and perhaps help solve the prospective buyer's financial problem. It can sell an idea but it can't and won't actually sell your equipment for you. That's your job!

Send your salesmen out with this picture in mind. Prepare your advertising with the same idea in view and send it out ahead to open the way for the salesman. Let advertising and direct selling do the job together—as they should. Advertising will take your sales message to the buying power of industry, to the people who are being urged to buy, by this powerful Committee on Industrial Rehabilitation. It is up to you to show them how your equipment will modernize their plants, cut their production costs, create more salable products, and better prepare them to profit by the upturn in business.

You don't have to commit yourself to advertising for a year, or even six months. You can advertise for the balance of 1932, and then judge the future on the basis of the outlook on January first.

Too many sellers have had cold feet too long. They've quit trying to sell because selling is no longer as easy as it was in the good old days. Let's get those feet off the ice . . . . . and sell!

Contributed by the McGraw-Hill Publishing Co.,

SEARCHLIGHT SECTION

EMPLOYMENT : BUSINESS : OPPORTUNITIES : EQUIPMENT—USED or RESALE

UNDISPLAYED—RATE PER WORD
Positions Wanted, **5 cents a word, minimum $1.00 an insertion, payable in advance.**
(See ¶ on Box Numbers.)
Positions Vacant **and all other classifications 10 cents a word, minimum charge $2.00.**
Proposals, **50 cents a line an insertion.**

INFORMATION:
Box Numbers in care of New York, Chicago and San Francisco offices count 10 words additional in undisplayed ads.
Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:
1 inch.....$6.00
2 to 3 inches..... 5.75 an inch
4 to 7 inches..... 5.50 an inch
Other spaces and contract rates on request.
An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

COPY FOR NEW ADVERTISEMENTS RECEIVED UNTIL 10 A. M. THE 27TH OF THE MONTH FOR THE ISSUE OUT THE FOLLOWING MONTH C.M.

ALPHABETICAL INDEX TO ADVERTISERS

This index is published as a convenience to the reader. Every care is taken to make it accurate, but *Construction Methods* assumes no responsibility for errors or omissions.

MANUFACTURERS of construction equipment and materials have taken advantage of the breathing spell that deferred maintenance programs have given them. When the railroads, Federal, state and municipal bureaus begin to release their backlog of orders they will find that these manufacturers have improved their time with well-directed technical research. New products have been developed. Old products have been improved. Future construction estimates will have to be planned with an eye open to the new economies of these new products. It will pay every engineer to familiarize himself with the products advertised in *Construction Methods* before writing his specifications for new projects.

On this Michigan paving job

CITIES SERVICE

lubricants and fuels were used exclusive

CITIES SERVICE OILS

ONCE - ALWAYS

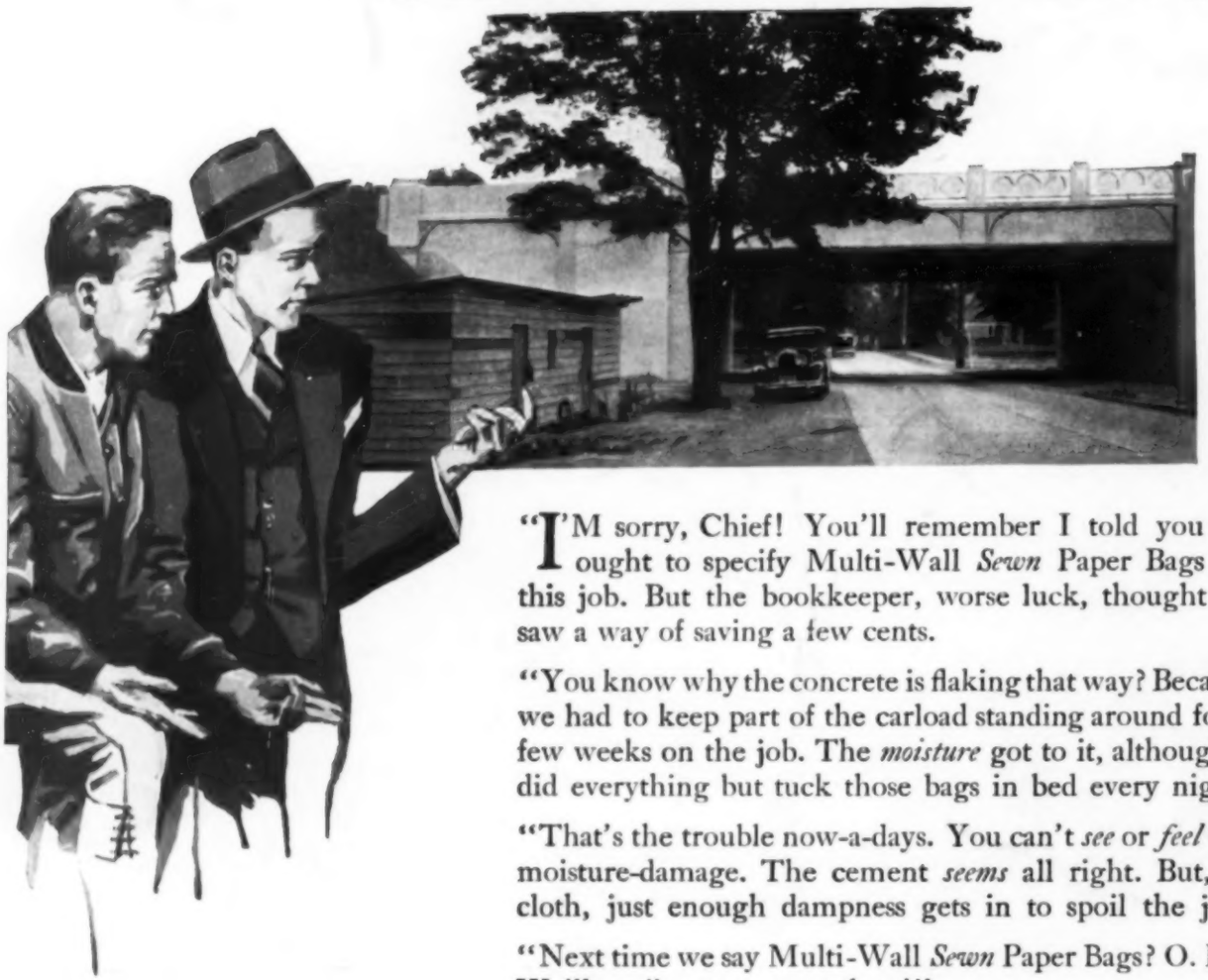
Satisfactory lubrication of paving machines is a tough problem — but Hilding Construction Company solved it easily. They simply turned to Cities Service.

Photograph shows their 27E Koehring Paver on a job near Adrian, Michigan—and incidentally, the whole job was Cities Service — gasolene and motor oil for the trucks as well as lubricants for the paver.

"IF IT'S CITIES SERVICE—IT HAS TO BE GOOD!"

Cities Service Oil Company • Cities Service Refining Company • Crew-Levick Company • Louisiana Oil Refining Corporation
Lindsay-McMillan Company • Winner Oil Company • Inter-State Oil Company • Gold Leaf Oil Company

"You never can tell . . . . until it's too late!"



"I'M sorry, Chief! You'll remember I told you we ought to specify Multi-Wall *Sewn* Paper Bags for this job. But the bookkeeper, worse luck, thought he saw a way of saving a few cents.

"You know why the concrete is flaking that way? Because we had to keep part of the carload standing around for a few weeks on the job. The *moisture* got to it, although I did everything but tuck those bags in bed every night.

"That's the trouble now-a-days. You can't *see* or *feel* the moisture-damage. The cement *seems* all right. But, in cloth, just enough dampness gets in to spoil the job.

"Next time we say Multi-Wall *Sewn* Paper Bags? O. K.! We'll *really* save money then!"

MULTI-WALL SEWN PAPER BAGS

Although there may be lots of jobs where the cement is used fast enough so that the moisture can't catch up with it, the only way to be sure *of getting sound concrete — especially with today's finely-ground cements — is to insist on the protection which the Multi-Wall* Sewn *Paper Bag alone can guarantee.*

The Associated Manufacturers of
MULTI-WALL *SEWN* PAPER BAGS
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